ELECTRICAL REVIEW

VOL. CLII 10th APRIL, 1953 No. 15

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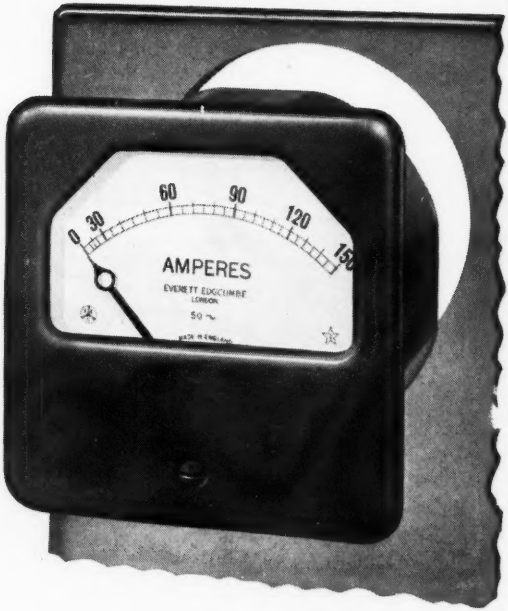
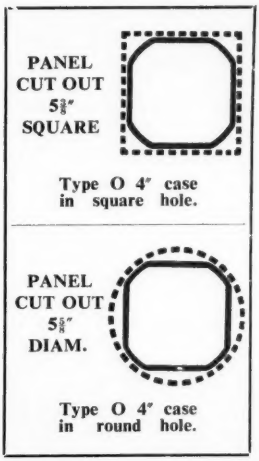
EDITORIAL, ADVERTISING & PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £3 6s 0d: U.S.A. and Canada $11.00. Cheques & P.O.s (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

Now- round holes..





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ELECTRICAL REVIEW

10th APRIL, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 15

India's Electrical Needs

ELECTRICALLY India is a backward country and although the mass of the population is not yet able to take advantage of electricity there is tremendous scope for immediate development in industrial and urban areas and eventually even in agricultural areas. At present the six principal cities take about 60 per cent of the electrical energy. This country of 360 million people still has less than 2,000 MW of generating plant and although hydro-electric schemes now in progress are expected to double this by 1956 and ultimately to add about 4,000 MW, it is obvious that the possibilities for expansion are much greater than this. Already two-thirds of the electricity generated in India is used in industry and the industrialization of the country, which is a principal aim of the Indian Government, will mean the early absorption of this extra power. If industrialization results, as experience has shown it does, in the raising of the standard of living of a significant part of the population electricity will play an important part in that improvement.

As regards manufacture, it is the Government's policy to let private industry find its own capital though some aid may be given in the case of industries of basic importance. Among the industries in this class which have been specifically mentioned is electrical engineering. There are certain other industries, including the manufacture of telecommunications apparatus, in which the establishment of new undertakings is to be the prerogative of the State, except where it is necessary to secure the co-operation of private enterprise.

Electrical manufacturing is not yet on a very large scale, although as Indian technicians and operatives advance in knowledge and skill it will undoubtedly expand. So far attention has been concentrated on specific lines. The home lamp-making industry is able to meet virtually all the country's demands, except for special types, and so is the fan industry. Fans have even been exported

on a small scale. The meter manufacturing industry is on the way towards meeting the home demand but it is largely dependent upon imported parts. Dry cells and accumulators are being produced but the output is much below the country's requirements and the same is true of refrigerators. So far there has been negligible production of heavy electrical plant though there has been progress in the production of small motors and transformers. Manufacture of wires and cables has made a considerable advance, a fact which is reflected in the progressive reduction of imports in the last three years, particularly in the telephone and telegraph classes. It is apparent that India will be largely dependent upon imports for most of her electrical needs for a long time yet, particularly if the plans for the production of electricity are implemented and expanded. Last year India was Great Britain's principal customer for electrical goods and apparatus and a leading buyer of electrical machinery. There is growing competition but this country is still predominant in the electrical market and can hold its position if its prices and products are satisfactory.

COMPONENT PROGRESS

British manufacturers of radio and electronic equipment, schooled during the war years to produce components of the very highest reliability for use in every climate, continue to keep up their standards, and it is significant that the industry itself has led the way in the establishment of standard specifications for almost the whole range of components. These have been published at intervals over the past few years by the Radio Industry Council, which represents all sections of the radio industry. An opportunity of seeing recent advances is afforded by the exhibition of the Radio and Electronic Component Manufacturers' Federation a preview of which appears elsewhere in this issue.

RURAL ELECTRICITY

It is one thing for farmers and country dwellers to clamour for the benefits of electricity and another to get them to use enough electricity to provide a reasonable return upon the expenditure involved. Since 1948 rural extensions in Northern Ireland have been made without guarantee but the inadequate revenue received from the generality of new rural consumers has forced the Government to revert to the former system. A new Bill seeks to restore the power of the Northern Ireland Electricity Supply Board to demand a guaranteed return before making an extension. Experience in this country has been similar, as is shown, for instance, in a letter in this issue from the South Western Electricity Board.

INDUSTRIAL ACCIDENTS

At a Press Conference last week Sir George Barnett, Chief Inspector of Factories, paid considerable attention to the fact that his report for 1951 showed a disturbing increase in the number of accidents associated with factory " internal transport," which he referred to as " mechanical handling." We think that Sir George's comments could be very misleading. The 1950 and 1951 accidents associated with transport were 5,375 and 6,241, but this sectional increase was part of the falling totals of 193,059 and 183,444 fatal and non-fatal accidents for 1950 and 1951, respectively, while the non-fatal accidents figure for 1951 of 182,616 was the lowest total recorded since 1938. These overall figures embrace several classifications other than " internal transport " or " mechanical handling " with which are associated older methods of handling goods, so is it not likely that the introduction of " mechanical handling " is also responsible, to some extent at least, for the reduction of accidents in the other classifications?

Overheating of Motors

Problems Arising During Operation

By "ROTOR"

THE overheating of a motor is often an indication of impending failure, but this can often be avoided if remedial measures are taken in time. Restricted ventilation is often the cause, as may be indicated by there being a feeble current of hot air from the motor outlet. If necessary the temperature of the windings may be measured and compared with the operating temperature for which the motor was designed.

The air inlet and outlet of a motor should not be restricted by placing the machine too near a wall or other obstruction. If a motor is fitted in a confined space, or in a hot air pocket in a roof recess, adequate ventilators should be provided to allow the heated air to escape and cool air to reach the motor. If a motor has to be used in a hot position it should be shielded from the source of heat and preferably supplied with cool air; it may be advisable to use a motor of such a size that it can be run on less than full load, or to use a motor with Class B insulation.

The motor should be kept clean internally and externally so that the cooling air can reach the points where heat is generated. When applying a blower or vacuum cleaner close to the windings it is an advantage if ventilating screens can be removed.

Each motor should have the correct type of cooling for the operating conditions. Pipe- or duct-ventilated motors are useful in a polluted atmosphere, provided the air pipes are of adequate size and have ample radii to avoid excessive air friction. Air inlets which are outside a building should be arranged to receive adequate air whatever the direction of the wind, and should be guarded to prevent birds nesting in the pipe. Where a single air pipe supplies several motors in a dirty atmosphere it may be advisable to fit a flap over the air outlets of the motors, as indicated in Fig. 1, to avoid running motors drawing dirty air through the open outlets of any motors which may happen to be stopped.

For driving boiler house and other plant which may be in a rather dirty position totally-enclosed motors are best. Totally-enclosed fan-cooled motors are suitable for dirty positions, provided they are free from grit or fluff. An air filter may be fitted in the cooling circuit of a motor if other methods of obtaining clean cooling air are impracticable. One filter has several cells through which air is drawn; each cell is a metal receptacle containing several small metal ferrules coated with specially prepared highly viscous mineral oil.

Excessive Loading

Motors often overheat because they are overloaded. It should be remembered that short-time rated motors are liable to reach a high temperature if used on full rated load for longer than the stipulated period. Such motors and totally-enclosed motors are generally unsuitable for overload conditions. Other motors over 1 h.p. may withstand 25 per cent overload for a certain time if the cooling air does not exceed 35 deg C. If the cooling air is at a higher temperature

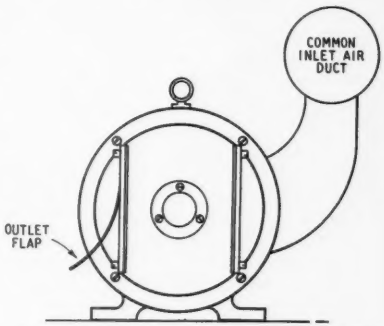


Fig. 1.—Arrangement for pipe-ventilated motors supplied from a common air duct

and overload capacity is required a larger motor should be installed.

Where a motor may be overloaded it is wise to install an ammeter permanently in the circuit. The current intake to other motors can conveniently be measured, when required, by means of a split-core ammeter, the reading being compared with the full load value. A high reading in all phases of a three-phase motor may indicate mechanical overload or low voltage. An unequal reading may indicate unequal line voltages or an electrical fault.

Many Possible Causes

Possible causes of mechanical overload are faulty lubrication or adjustment of driven plant, tight belts, blunt cutting tools, dirt or other foreign matter in the air gap between the rotor and stator, increase of speed or feed of driven plant, etc. It may be necessary to reduce the load or to install a larger motor. In the case of a motor which drives an intermittent load of high inertia, such as a press, which has a flywheel in the drive, a high slip type of motor has an advantage over a motor with normal slip. Since, on a given load torque, the speed of the high slip motor will fall to a greater degree than that of a standard motor, the high slip motor can use the energy of the flywheel to a greater degree, thus reducing the peak load and current.

In case of overheating it may be necessary to measure the voltage at the motor terminals on load. On low voltage a motor takes an increased current to develop normal horse power. A reduced load may be necessary to avoid overheating. The motor should not overheat if the ratio $\frac{\text{h.p. load}}{\text{voltage}}$ is not more than the ratio $\frac{\text{rated h.p.}}{\text{rated volts}}$. Low voltage at the motor may be due to the cables being too small with respect to their length or to low supply voltage.

When used on an increased voltage an induction motor takes an increased magnetizing current to produce the required induced voltage per turn in the coils. Thus it will run hotter than normal on increased voltage. When used on less than normal frequency a similar trouble may be experienced, particularly as the ventilation will be impaired by the lowering of the speed. When used on an increased frequency, however, the magnetic flux and magnetizing current will be reduced and there may be some reduction of iron loss. The motor may overheat on load, however, due to the output of the driven plant being increased with the speed, especially when it is driving a centrifugal fan or pump for instance. Horse power is proportional to the product of torque and speed.

A motor may overheat and burn out on load if a star-delta starter is left in the starting position, because this reduces the voltage at the motor windings to 58 per cent of normal. A similar effect is likely if an auto-transformer starter is left in the starting position; in this case the short-time rated auto-transformer also may burn out. A motor has overheated on load due to its windings being connected in star and started direct-on-line, instead of being used with a star-delta starter and run with the delta connection. This is equivalent to using the motor on 58 per cent of normal voltage. Fig. 2 shows that a motor may then run at about 78 per cent of synchronous speed on full load torque, instead of 96 per cent in delta, and the windings may carry a very much higher current than normal. An unloaded three-phase motor has overheated because its stator windings have been connected in delta instead of star, this being equivalent to using the motor on 172 per cent voltage.

On load a dual-voltage motor may burn out if the windings are connected in series instead of parallel on the lower voltage, since each section of the windings will then have to carry the full motor current instead of half. If the windings are connected in

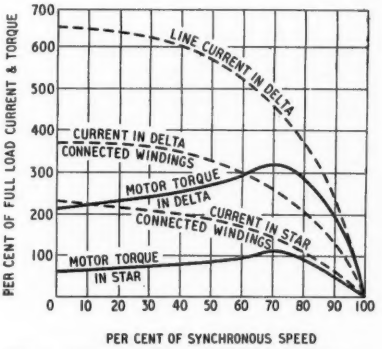


Fig. 2.—Current and torque of a typical three-phase squirrel-cage motor

parallel, instead of series, on the higher voltage increased magnetizing current may cause overheating on all loads, this being equivalent to using the motor on twice normal voltage.

A d.c. motor runs at a reduced speed on low voltage. The field current of a shunt motor will be reduced in proportion to the voltage and the field coil heating reduced in proportion to $\frac{E^2}{R}$. The magnetic field flux, however, will not be reduced to the same extent as the voltage, especially if the motor has fairly saturated field magnets. The speed will be reduced practically in proportion to $\frac{\text{voltage}}{\text{field flux}}$, thus the motor speed will not be reduced to the same extent as the voltage. The motor horse power is proportional to torque times speed; thus the motor is likely to have hot armature windings if used on full load torque on reduced voltage; i.e., if the $\frac{\text{h.p. load}}{\text{voltage}}$ exceeds the normal ratio of $\frac{\text{rated h.p.}}{\text{rated volts}}$. If used on more than normal voltage the shunt field coils are liable to overheat even on no load. The motor speed will increase on higher voltage and this may result in overheating of the armature because of increased output of the driven plant, also.

Unbalanced Circuits

Unequal line currents to a three-phase motor may result from a short circuit, open circuit, or earth fault in the motor, or from unbalanced line voltages. The last-named defect may be caused by supply troubles, unbalanced single-phase loads, or to a high resistance or open circuit in the line to the motor. High resistance is sometimes caused by a faulty contact or connection, while an open circuit may result from an earth fault or a melted fuse. The fuses for a three-phase motor should be kept the same size in each pole. A three-phase motor will not be self-starting with one line broken, but may continue to run if the break occurs while running. The motor will take an increased current from the two sound supply lines and may appear to be labouring. In the case of a delta-connected motor the proportional increase of current in the winding connected between the two sound lines will be greater than the proportional increase of current in the two lines. Thus

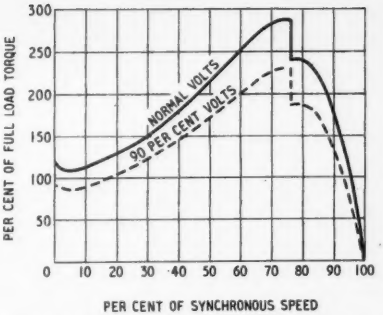


Fig. 3.—Effect of reduced voltage on the torque of a single-phase split-phase-start motor

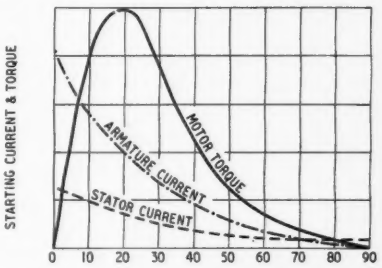


Fig. 4.—Effect of brush position on the starting conditions in a repulsion motor

line-connected over-current trips do not afford complete protection and special trips, operating on unbalanced line currents to the motor, may be advisable.

Single-phase motors may overheat through faulty starting, overload, incorrect voltage, incorrect connections or restricted ventilation, as in the case of other types. It is essential for single-phase motors to accelerate quickly otherwise the short-time rated starting windings and resistor or capacitor may fail, followed by burning out of the running winding. Fig. 3 shows how the starting torque falls slightly as the motor starts to accelerate. Thus high starting load or low voltage may result in the motor crawling and taking an excessive current. The starting torque of a repulsion type motor may vary slightly with the position of the rotor when switched on, and may vary considerably with the brush position and grade of brushes used (see Fig. 4).

Faulty starting and overheating at starting of a repulsion-start induction motor may result from the short circuiting gear sticking in contact with the commutator.

The starting torque of a series motor will be reduced by low voltage, or by wrong brush position, electrical fault, etc. On low voltage the motor speed will be reduced, however, thus reducing the output of the driven plant. This will prevent overheating providing the load is not deliberately increased. Fractional h.p. motors in general have little overload capacity. It may be noted that repulsion-induction motors may run hotter on no load than on load.

Methods of safeguarding single-phase motors against overheating are generally similar to those advised for three-phase motors. In some cases of overheating during starting a motor of higher starting torque may be advisable. In general, repulsion, repulsion-start induction, and repulsion-induction motors have a high starting torque, as also have many capacitor start motors, especially those designed for driving refrigerator compressors.

Faults in Coils

Reduced starting torque and overheating when running may result if the brushes of a d.c. motor are not in the right position. A short-circuited stator coil in a three-phase motor may be indicated by unequal line currents. A short-circuited stator coil of an a.c. motor or an armature coil in a d.c. motor will overheat very quickly and probably burn out. Armature coils may burn out through short-circuiting of intersegment micas in the commutator, possibly due to carbon dust on the micas, and may be indicated by sparking round the commutator. It may be necessary to scrape away the carbonized mica, filling in the resulting holes with commutator cement.

An open-circuited armature coil in a d.c. motor will cause other parts of the winding to carry an increased current, and they may overheat on load. This fault causes sparking at the brushes and burning of the commutator segments connected to the faulty coil. A short-circuited shunt field coil may run cooler than the sound coils. Armature and field coils may be tested for open circuits and short circuits by volt drop tests. An earth fault also may be the cause of overheating and may be detected by means of a test lamp or a " Megger " insulation test set. Local overheating may be caused by a slack, dirty or unsoldered connection.

Overheating of the armature of a d.c. motor, which has no obvious cause, may be due to circulating currents. These may occur through wrong brush position, unequal brush spacing or brush pressure, or unequal field strength. The last-named trouble may be caused by faulty field windings, blowholes in the field casting, or unequal air gap between the armature and field poles, possibly due to worn bearings. Excessive eddy currents may cause heating at all loads if the insulation between the core stampings becomes damaged or short-circuited, as may occur if worn bearings allow the armature to rub on the field poles, or the rotor to rub on the stator.

The most serious mechanical cause of overheating is overload when worn bearings allow the armature or rotor to rub; similar overheating has occurred through rubbing on a deposit of dirt or other foreign matter in the air gap. Sleeve bearings may be overheated on account of inadequate lubrication caused by leaking oil, the wrong sort of oil, or through the oil rings in the bearings sticking. Other causes are bent shafts, rough shafts or bearings, excessive belt tension, or misalignment of a motor on a direct-coupled drive. Excessive grease may cause overheating of ball or roller bearings.

Many causes of overheating can obviously be avoided by expert periodical inspection and efficient maintenance, but other accidental causes cannot always be anticipated. For this reason each motor should be protected by automatic over-current trips. The trips should preferably function on a sustained current 25 per cent above the normal full load current. However, some variable-speed motors, such as a three-phase commutator motor, have a reduced horse power loading at low speeds. Thus the secondary winding of a three-phase commutator motor may be fully loaded when the primary current is less than the full load value allowable on high speed. Such a motor may be protected against overload on all loads by means of an over-current trip connected in the secondary circuit to control the primary switch.

Good protection against overload of motors subject to widely varying loads may be provided by means of a thermal device incorporated in the motor to switch off the supply if the machine reaches an excessive temperature.

British Radio Components

Preview of Tenth R.E.C.M.F. Exhibition

THE tenth annual private exhibition of the Radio and Electronic Component Manufacturers' Federation to be held at Grosvenor House, Park Lane, London, next week (14th–16th April) will be the largest and most comprehensive of the series. In ten years the number of exhibitors (now 120) has doubled and the display area increased six-fold.

Before the war 90 per cent of the products of members of the Federation were used in the manufacture of British domestic radio and television receivers. To-day, in spite of the expansion of television (each set uses something like four times as many components as there are in a radio receiver), only 40 per cent of British components are used in this way. Direct export sales of loose components account for 25 per cent of the production and the rest goes into communication equipment, radar, scientific instruments, medical apparatus, and the steadily increasing electronic equipment in diverse industries.

Admission to the exhibition is by ticket obtainable from the Radio and Electronic Component Manufacturers' Federation, 22, Surrey Street, Strand, London, W.C.2. The exhibition will be open from 10 a.m. to 6 p.m. on the first two days and until 5 p.m. on the closing day.

Wires and Cables

A major section of the exhibition will be devoted to wires, cables and insulating materials of all types. Here a range of plastic insulated wires, with striped colour marking, will be shown by W. T. Henley's Telegraph Works Co., Ltd., together with set wires and flexibles, winding wires, strips and strands, relay cables, microphone flexibles, miniature cables and radio aerials. Enamelled wires for the production of self-supporting coils will be featured in the comprehensive display of bare and insulated wires on the stand of the London Electric Wire Co. & Smiths, Ltd., while an associated company, the Vactite Wire Co., Ltd., will have fine and very fine wires together with "Vacrom" and "Eureka" resistance wires and tapes, and wires for use in lamps, valves and cathode-ray tubes.

British Insulated Callender's Cables, Ltd., will have connecting wires insulated with p.v.c., p.t.f.e., polythene or silicone rubber alongside miniature multi-way cables, r.f. cables, cables specially sheathed for use with underwater television cameras, winding wires and capacitors. Rubber and p.v.c. insulated, screened and unscreened cables and flexibles will be shown by the Reliance Electrical Wire Co., Ltd., as well as coaxial cable suitable for use with equipment of American design. A new insulating material to be shown by H. D. Symons & Co., Ltd., is made from silicone elastomer. This company has also added rolled varnished "Terylene" to its range of "Symite" high tension rolled fabric sleeving.

Aluminium-clad iron for valve electrodes is being produced in experimental quantities by the Telegraph Construction & Maintenance Co., Ltd., as well as "Telconal," an alloy not containing nickel which has been developed as a substitute for the nickel–copper resistance alloy "Constantan." The resistivities of the two are similar, but "Telconal" has the advantage of developing very low thermal e.m.f. against copper and being 12 per cent lighter gives a proportionately greater number of ohms/lb for a given gauge of wire or strip.

Capacitor Dielectric Materials

Taylor Tunnicliff (Refractories), Ltd., will show a new ceramic capacitor dielectric material with a permittivity of 36 and a control temperature coefficient of 30 parts/million/deg. A range of ceramic insulators suitable for capacitor dielectrics to be shown by George Bray & Co., Ltd., will include sillimanite material suitable for temperatures up to 1,200 deg C and an alumina material for valves, cathode-ray tubes and pyrometric equipment for temperatures up to 1,600 deg C.

Apart from a moulding material which

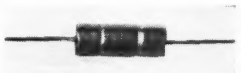
will absorb X-rays, Mycalex, Ltd., will show a new grade of "Micatherm" which is much cheaper than "Mycalex" and will perform many of the functions for which the latter has been used. It has a high electric strength and is completely non-tracking. The exhibit of Fine Wires, Ltd., will demonstrate the use of textiles for covering fine wires while Thomas de la Rue & Co., Ltd., will have various grades of "Delaron" and "Traffolyte" laminated plastic on view. The range of articles made from electro-ceramics displayed by Steatite & Porcelain Products, Ltd., will show the very fine tolerances which can be achieved by special grinding methods and illustrate the success of the nickel metallizing technique which was introduced at last year's exhibition. Apart from a polythene anti-corona ring for television tubes, British Moulded Plastics, Ltd., will show a moulded cabinet for a 14in television set which is believed to be the first of its kind in Europe. Other exhibitors in this section will include Bakelite, Ltd., Bullers, Ltd., Connollys (Blackley), Ltd., H. Clarke & Co. (Manchester), Ltd., Hellermann, Ltd., and Micanite & Insulators Co., Ltd.

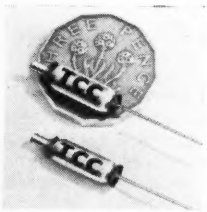
As would be expected, capacitors of all shapes and sizes will be on view. Suflex, Ltd., will have polystyrene film capacitors with a temperature range of −40 deg C to +85 deg C with capacitances from 5 pF to 5,000 pF with a minimum tolerance of 1 per cent or 0·5 pF. All the electrolytics to be shown by Daly (Condensers), Ltd., are suitable for operation at 85 deg C and in atmospheric moistures of up to 100 per cent. Some examples are only of $\frac{5}{8}$in diameter by $1\frac{3}{8}$in long, which two years ago would have been $\frac{3}{4}$in diameter by 2in long at least. The miniature capacitors to be shown by A. H. Hunt (Capacitors), Ltd., under the name "Thermetic Midget" have the hitherto unobtainable temperature range of −100 deg C to +120 deg C. The capacity range is 2·5 pF to 0·04 μF in four sizes from 0·18in diameter by 0·5in long to 0·26in diameter by 0·61in long. Apart from tantalum electrolytic condensers which contain a substantially neutral electrolyte and have a temperature range of −50 deg C to +100 deg C, the Telegraph Condenser Co., Ltd., will show the smallest electrolytics ever made. They are for use in miniature hearing aids and are of plug-in construction.

The wide range of resistors, capacitors and printed circuits to be displayed by Erie Resistor, Ltd., will include ceramic capacitors for mains isolation at aerial sockets and similar danger points in radio and television receivers. One capacitor in this range is also suitable for suppressing the television interference caused by small domestic motors. A new range of plastic film capacitors in tubular and rectangular metal cases is to be displayed by the Telephone Manufacturing Co., Ltd., alongside relays, powder cores and line transformers. Other capacitors will be shown by the Static Condenser Co., Ltd., Stability Radio Components, Ltd., the London Electrical Manufacturing Co., Ltd., and the Wego Condenser Co., Ltd.

The comprehensive display of capacitors to be arranged by the Dubilier Condenser Co. (1925), Ltd., will be accompanied by a range of insulated resistors illustrating the high degree of "miniaturization" which can be achieved without sacrificing performance. Apart from toggle switches, plugs and sockets, wirewound and high stability carbon resistors, Painton & Co., Ltd., is introducing its BM fader, a miniature rotary instrument having provision for a 40-step bridge "T" network. A subminiature volume control with on/off switch will be shown for the first time by Egen Electric, Ltd., as well as a pre-set subminiature control suitable for use in

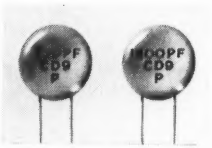
A. H. Hunt "Thermetic Midget" capacitor

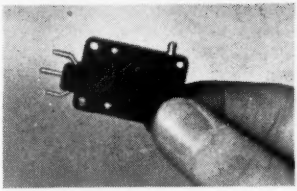


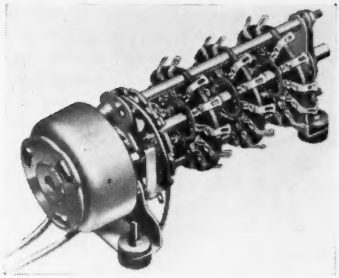


T.C.C. miniature electrolytics for use in hearing aids

Erie ceramic capacitors for mains isolation







Above: **Bulgin type "M" miniature micro-switch**

Right: **"Ledex" rotary solenoid and circuit selector**

miniature electronic equipment such as might be found in guided missiles.

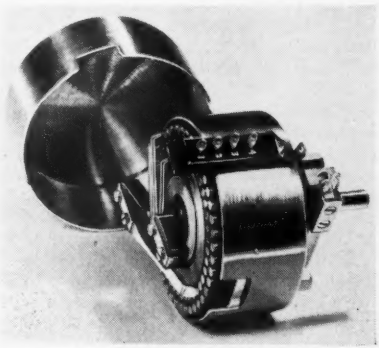
In addition to its standard range of rotary and toggle switches "Diamond H" Switches, Ltd., will have a new 3 A totally enclosed toggle switch, a double-pole a.c. only snap-in toggle switch and a new range of 10 A rotary packet switches for a.c./d.c. and a.c. only. "Oak wafer switches," Cutler-Hammer appliance switches and potentiometers will be exhibited by N.S.F., Ltd., together with three sizes of "Ledex" rotary solenoids and circuit selectors which are now being made in this country. Other rotary switches will be shown by A.B. Metal Products, Ltd., the British Electric Resistance Co., Ltd., and the Plessey Co., Ltd. The type "M" miniature micro-switches of A. F. Bulgin & Co., Ltd., are claimed to be the smallest in the world yet they are suitable for operation in 250 V circuits at up to 1·5 A (3 A at 125 V). The "Minitrip" miniature thermal delay switch to be shown by Belling & Lee, Ltd., is primarily for safeguarding circuits in television receivers. Other items to be introduced by the company include fuse-holders, both sealed and neon indicating types of single and twin construction, interference suppressors and coaxial plugs and sockets.

Sintered permanent magnets will be shown by Murex, Ltd., together with drawn zirconium tube, ductile zirconium and tantalum sheet. James Neill & Co. (Sheffield), Ltd., will have permanent magnets for use in television receivers while Mullard, Ltd., will show magnetic materials such as "Ferroxcube" and "Magnadur," the latter taking the place of the normal iron or steel permanent magnet and retaining its magnetism despite rough handling and shocks. Other firms in this section include Magnetic & Electrical Alloys, Ltd., Marrison & Catherall, Ltd., and Swift Levick & Sons, Ltd.

Several firms will show instruments for laboratory, workshop and industrial use. Dawe Instruments, Ltd., will introduce a new sound level indicator covering the range 40 to 130 db while Marconi Instruments, Ltd., will have a transportable signal generator operating over the range 20–80 Mc/s in two bands; the output may be unmodulated, sine wave frequency modulated, or sine wave or square wave amplitude modulated. For the first time the Salford Electrical Instrument Co., Ltd., will

Belling & Lee "Minitrip" miniature thermal delay switch

Painton type BM fader

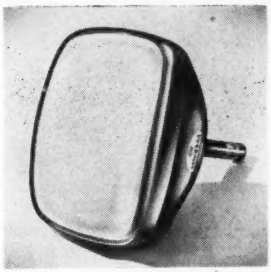


demonstrate a precision frequency measuring equipment as used for quartz crystal calibration, together with a new quartz crystal activity test set. Signal generators will be exhibited by Advance Components, Ltd., and multi-range test meters will be shown by the Automatic Coil Winder & Electrical Equipment Co., Ltd., and Taylor Electrical Instruments, Ltd.

A range of indirectly heated sub-miniature valves is to make its first appearance on the stand of the General Electric Co., Ltd., alongside a new quiet a.f. pentode suitable as a first stage valve in high gain amplifiers and a new high slope r.f. pentode with characteristics eminently suited to video amplification. Among the cathode-ray tubes there will be a 14in all-glass rectangular and a 12in circular tube with a flat face. The valve and electron tube exhibit of Mullard, Ltd., will include a new series of 25 mA miniature valves for all-dry battery portable receivers, a 17in rectangular long-life television picture tube which incorporates a new type of electron gun ensuring uniform focusing over the whole screen, a range of high-grade noval-based amplifier valves and germanium crystal diodes for television receiver applications.

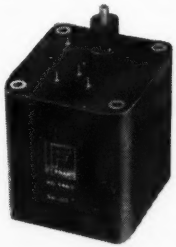
Valves are also being shown by Standard Telephones & Cables, Ltd., as well as "SenTerCel" selenium rectifiers, quartz crystals, thermistors and magnetic materials. Ferranti, Ltd., will have a comprehensive range of valves and cathode-ray tubes on view together with a selection of small transformers and chokes. Here, the "Pentland" series of resin cast components designed to meet, at low cost, the stringent requirements of Interservices Specification R.C.S. 214 will be seen for the first time. Other valves and cathode-ray tubes will be displayed by the Edison Swan Electric Co., Ltd., and the English Electric Co., Ltd. Apart from "C" type cores and hermetically sealed and open type transformers embodying these cores, the latter company will also have an electronic 10 kV insulation test set. This is an adjustable source of d.c. (500 V–10,000 V) for voltage and insulation testing with a built-in means of measuring the voltage applied.

Transformers of all types are found in almost every piece of electronic apparatus and a comprehensive range of these components will be exhibited by Parmeko, Ltd., Partridge Transformers, Ltd., Gresham

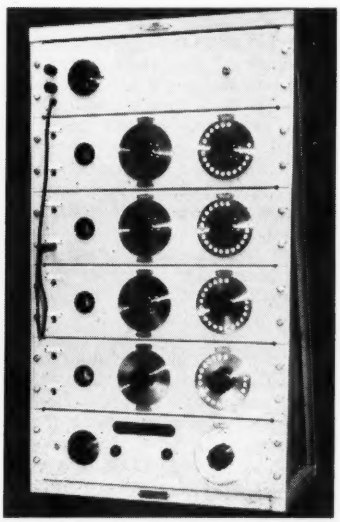


Mullard 17in rectangular long-life television picture tube

Ferranti "Pentland" resin cast transformer



Salford precision frequency measuring equipment for quartz crystal calibration



Transformers, Ltd., Igranic Electric Co., Ltd., and the Woden Transformer Co., Ltd. A wide variety of loudspeakers will be shown on the stands of such firms as Electro-Acoustic Industries, Ltd., Goodmans Industries, Ltd., Rola Celestion, Ltd., Tannoy Products, Ltd., Truvox, Ltd., Vitavox, Ltd., and the Whiteley Electrical Radio Co., Ltd.

A new aluminium based lightweight rectifier for aircraft power supplies will be shown among a comprehensive selection of other rectifiers by the Westinghouse Brake & Signal Co., Ltd., while solder for all purposes will be demonstrated by Enthoven Solders, Ltd. The solder tape of Multicore Solder, Ltd., contains three cores of "Ersin" non-corrosive flux and can be applied to a wire joint simply by wrapping it around the wire and applying a match flame.

FACTORY INSPECTOR'S REPORT

Improvements in Working Conditions

THE annual report of the Chief Inspector of Factories for the year 1951 (Cmd. 8772, H.M. Stationery Office, price 6s 6d) published last week follows in the main the usual form. This time, however, there is a survey of 50 years' work since the passing in 1901 of the great consolidating Factory and Workshop Act. Since that time the Factories Act, 1937, has been the only major revision of the law combined with consolidation.

Inspectors in selected districts have made reports on the changes in their areas or in some special trades connected with them, and this work has been assisted by the memories of both employers and employees who have served in the same factories for the past half-century. During the fifty years many shifts in industrial locations have taken place, although the great basic industries have remained more or less where they were. Notable exceptions are that the slag heaps are all that remain of the world's greatest iron works of Merthyr and Dowlais.

Fewer Fatalities

Because the legal provisions governing the reportability of accidents have varied during the period, valid conclusions cannot be drawn on the whole from comparison of figures for 1901 and 1951. Fatal accidents are in a class by themselves and it is noteworthy that in 1901 when there were 95,664 factories with electric power and 137,648 factories without it, there were 1,035 fatal accidents, while in 1951, when there were 212,245 factories with power and only 26,464 factories without, there were only 828 fatal accidents.

All reports agree that improvements in lighting have been among the most important benefits of the fifty years. Gloom and the pervading smell of gas linger vividly in the memories of those who started work early in the century, but even then the inspectors were already commenting on the improved illumination and purity of the air in cotton factories where electric lighting had been newly installed.

Controlled Maintenance

In the past only a few of the occupiers of the larger and more progressive factories have seriously recognized controlled maintenance of electrical apparatus to be an essential service to production. More recent reports, however, indicate that it is now being more generally recognized that production depends largely on reliable electrical installations with effective maintenance.

Industrial applications of the thyratron, photo-electric cell, and high frequency induction and dielectric heating equipment continue to improve the conditions of factory workers and to ensure greater economy in manpower.

There is a tendency to use various photo-electric cell devices for guarding dangerous parts of machinery, but some machines so fitted revealed on examination that they did not satisfy the requirements of the Act because the standard of safety was lower than that provided by some mechanical guards in use in this country.

Portable power tools are being increasingly recognized as a contribution to greater production, and reduced voltages for such electric tools have been advocated in these reports. In this connection the importance of the adoption of a uniform voltage to secure interchangeability and standardization is stressed.

Turning to the usual survey of accidents, the total number of fatal accidents in 1951 was 828, as compared with 779 in 1950, while the number of non-fatal accidents fell by 5 per cent, from 192,260 to 182,616. The total number of electrical accidents in 1951 was 715, as compared with 778 for 1950. This figure for 1951 includes 34 fatal accidents and 681 non-fatal accidents. Of the fatal accidents by far the largest number (24) were sustained by unskilled men. In the case of the non-fatal accidents the highest classified figure of 191 relates to electricians, jointers, etc., while the second worst figure is 169 for unskilled men.

The figure for non-fatal accidents includes 152 cases of eye-flash from electric welding, unclassified as to occupation. Seven of the 34 fatal accidents related to portable machines, in six cases to cables for fixed apparatus, in five to portable lamps, in four to switchgear above 650 V, in two each to cables and flexibles for portable equipment and to plugs and adaptors, and in one case each to fixed transformers, switchgear below 650 V, and crane trolleys.

The following are selections from the list of electrical accidents due to explosion or fire during 1951. A mechanic dropped a safety type handlamp on the concrete floor of a pit; the impact broke the lamp and the exposed hot element ignited petrol fumes and set fire to his clothing. A fluorescent lighting fitting inadequately secured to a low ceiling swung down, thereby breaking the flexible cables and causing electrical ignition of resin dust; a worker was burned. An explosion in an accumulator box in the cab of a stationary diesel locomotive fractured six bolts and blew off the lid of the box; the driver was injured.

A mechanic used a naked light to see if a 15-cell battery had been topped; the resulting explosion caused facial injury and acid burns. A portable electric welding set was mounted on a vehicle and the charge-hand filled the petrol tank without stopping the set; in the resulting explosion and fire the generating set and the lorry were destroyed.

Telephone Traffic Investigations

IN a telephone exchange subscribers are regarded as originating calls independently of each other. Under these conditions if the number of subscribers on the exchange is large the probability of various numbers of calls occurring during an interval in the busy hour is given by the terms of the Poisson distributions. Such calls are described as originating by pure chance and in investigating the resulting traffic problems which arise in telephone exchanges it has been found necessary to develop a special machine. This is described in a paper by Mr. S. W. Broadhurst (Post Office Research Station) and Mr. A. T. Harmston (Post Office Engineering Department) presented at an extra meeting of the Institution of Electrical Engineers in London last week.

The machine consists essentially of two parts, one to simulate the random occurrence and release of calls, and the other to provide the analogue of the trunking system it is required to examine. The authors describe a design employing electronic techniques in which the random feature is obtained from the noise voltages developed by cold-cathode gas-discharge tubes. The theory of the machine is discussed and possible future applications of its basic principles are outlined.

The traffic analyser has given very good service, and experience over a period of four years shows that the techniques employed are reliable. Faults are infrequent, and when they do occur are usually easy to localize and do not lead to the acceptance of false results. The basic principles of the machine can readily be applied to the solution of many problems other than those relating to telephone traffic.

Battery Vehicle Exhibition

AN exhibition of over thirty battery electric vehicles of various makes and types, together with battery chargers and other components, is being held by the South Eastern Electricity Board at "Rough Rew," Horsham Road, Dorking, from 14th to 17th April.

Electronic Speed Control

Application to Glass Grinding Machines

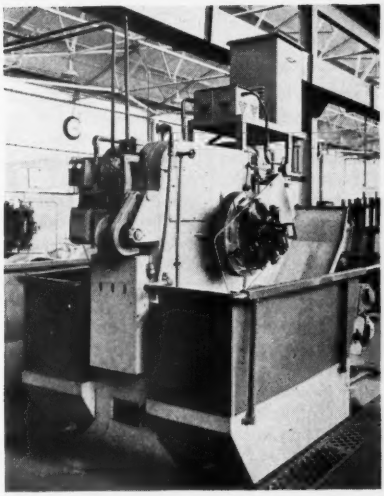


Fig. 1.—Electronically controlled machine for grinding the edges of motor car windows

IN the many industrial processes requiring variable speed drives, d.c. motors with electronic speed control are rapidly gaining popularity. The high accuracy and rapid response obtainable from electronic control gear make it particularly suitable for modern high-speed production methods while its essentially static nature removes many possible causes of unreliability associated with other types of apparatus.

A further advantage of electronic speed control systems is that they may readily be incorporated in automatic control schemes. An instance of this is at the St. Helens Works of Triplex (Northern), Ltd., where a mechanical system has been replaced by electronic equipment to provide the variable speed drive for machines used to grind the edges of car windows (Fig. 1).

The windows are mounted in pairs on a rotating chuck and are held in position by means of toggle action clamps. The grindstone, which rotates at constant speed in bearings mounted on one end of a pivoted arm, is held in contact with the edge of the glass by means of counterweights. The speed at which the glass passes over the stone is critical so the chuck speed must be accurately controlled in order that the windows shall be ground to the correct profile. A considerable speed range is involved and at certain points, particularly when sharp corners are being ground, a rapid variation in chuck speed is necessary.

The chuck is driven by a 1 h.p. variable speed d.c. motor which is separately excited from a bridge-connected metal rectifier fed from the secondary of a transformer T_2 (see Fig. 2). The armature supply is derived from a pair of thyratrons V_1 and V_2. Control of the armature current and, therefore, of the motor speed, is effected by comparing a fixed proportion of the output voltage of the thyratrons with a reference voltage proportional to the motor speed required. The resulting difference voltage is fed to a valve amplifier whose output controls the operation of a phase-shifting network in the grid circuit of the thyratrons so as to increase or reduce the speed of the motor to the value required.

The reference voltage is obtained from a small potentiometer fed from a stabilized d.c. source. The setting of this potentiometer is varied by a cam mounted at one end of the machine and rotating in synchronism with the chuck. The cam profile, which varies according to the size and shape of the windows being ground, is determined empirically, and the motion of the follower is transmitted to the potentiometer slider through a link mechanism. The voltage with which the output from the potentiometer is compared is that across the resistor R_2 which forms one arm of the potentiometer R_2–R_3 connected across the output terminals of the thyratrons.

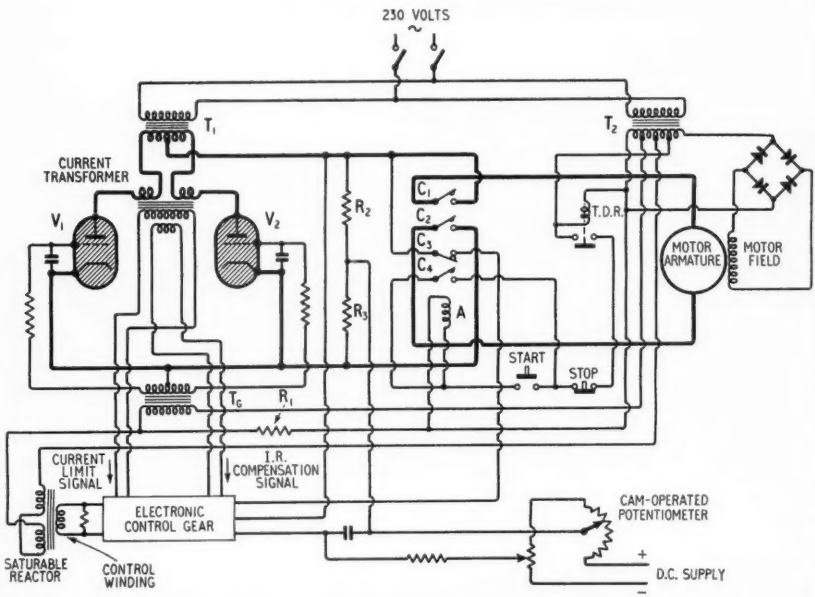
The way in which the phase-shifting network operates may be understood by considering a simple circuit consisting of a pure

resistor R and a pure reactor X connected in series and supplied, with a voltage E_S, from the secondary of a transformer (Fig. 3a). If the voltages across R and X are represented by vectors E_R and E_X respectively (Fig. 3b), then the supply voltage will be represented by the resultant vector E_S. The vectors E_R and E_X will be at right angles to each other whatever the relative values of R and X may be. Therefore, for varying values of these components, the locus of the point at which the vector E_R meets the vector E_X will be a semi-circle with the vector E_S as diameter, so long as the supply voltage remains constant.

If connections are taken from the centre point of the transformer secondary and from the connection between R and X (Fig. 3c), the voltage, V, between these leads is represented by a vector drawn from the centre point of the vector E_S to the point of junction of vectors E_R and E_X (Fig. 3d). This is the radius of the semi-circle of which the vector E_S is a diameter and if the relative values of R and X are varied, the vector V, while remaining of constant length, will rotate about the mid-point of the vector E_S. In other words, if either of the components R and X is variable, it is possible to obtain an output of constant voltage equal to $\frac{1}{2} E_S$, but whose phase relationship with the supply voltage is variable.

In the control circuit the series components of the phase-shifting network are a fixed resistor R_1 and a saturable reactor, the supply being obtained from the secondary of T_2. The control winding of the saturable reactor is fed with the amplified difference voltage from the control circuit so that any variation in this difference voltage produces a corresponding variation in the inductance of the reactor. The resulting constant voltage, variable phase output from the phase-shifting network is fed to the primary of grid transformer T_G. One end of the secondary of T_G is connected to the grid of thyratron V_1 and the other end to the grid of V_2, the centre point of the winding being connected to the common cathode lead. Thus, the grid voltages of the two thyratrons are 180 deg out-of-phase as required for full wave rectification. Since the supply to the anodes of the thyratrons is in phase with the supply to the phase-shifting network, any variation

Fig. 2.—Simplified schematic diagram of the control circuit



in the difference voltage obtained from the control circuit will produce a proportional variation in the phase difference between the grid and anode voltages of the thyratrons. This, in turn, will result in a variation of the firing period of the thyratrons which will vary the armature current. Thus, any movement of the cam follower will result in a proportional variation of the motor speed, and the grinding speed at all stages of the operation will be automatically determined by the cam profile.

To start the machine, the main switch is first closed to connect the primaries of T_1 and T_2 to the 230 V 50 c/s mains. The motor field is immediately energized from the secondary of T_2 which also feeds the heaters of the thyratrons and the power pack for the electronic control gear and reference potentiometer. At the same time, the operating coil of time delay relay T.D.R. is energized and, after allowing an adequate time for the thyratrons to warm up, the relay closes. The motor can then be started by means of the "start" push-button, which completes the circuit through coil A, causing its associated contactors to operate. Contactors C_1 and C_2 connect the motor armature to the output from the thyratrons while C_4 closes to maintain the circuit through coil A. The remaining contactor, C_3, which opens at the same time as the others close, controls the operation of the electronic gear in such a way that the load is applied gradually to the thyratrons.

Two auxiliary control circuits are also provided, these being energized from a current transformer in the anode circuit of the thyratrons. One circuit is designed to limit the armature current to a predetermined safe value to avoid overloading the

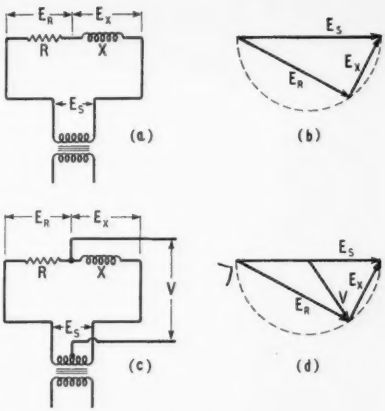


Fig. 3.—Diagrams to illustrate the operation of the phase-shifting network

thyratrons, while the other provides compensation for the natural drop in speed of the motor at increasing loads.

Each motor drives two chucks, one on either side of the machine, so that four windows may be ground simultaneously. The reference potentiometer is mounted alongside the motor while the rest of the control gear, including the thyratrons, is housed in a sheet steel cubicle which, together with the main transformer, is supported on a platform above the motor.

The equipment, which has been designed and manufactured by the General Electric Co., Ltd., is capable of providing a speed range more than adequate for the duties involved while many of the difficulties previously experienced have disappeared.

Recent British Standards

AMONG specifications recently issued by the British Standards Institution is B.S. 1957, price 2s 6d, for thermosetting synthetic resin bonded paper round tubes for use at radio frequencies, which sets out the requirements for two grades of circular tube.

B.S.* 1961, price 4s, for enamelled (oleo-resinous) round copper wire is a metric edition of B.S. 156 (1951) and differs only in that all quantities and diameters are expressed in metric units, and that details are omitted of wires complying with Brown and Sharp gauges. This new specification has been prepared primarily from the point of view of export and B.S. 156 is still appropriate to normal United Kingdom purposes.

B.S. 1962, price 2s 6d, for patients' trolleys with a fixed top for indoor use in hospitals is one of a number concerned with devices of this or similar kind. It has been prepared with careful consideration of the risks that may arise from the accumulation of static electricity. The recommended limits of electrical resistance and method of testing the trolley castors are set out in an appendix.

These documents are obtainable at the prices quoted, post free, from the British Standards Institution, 24, Victoria Street, London, S.W.1.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE directors of Crompton Parkinson, Ltd., announce with regret the resignation of **Mr. Albert Parkinson,** M.B.E., as a joint managing director of the company, a position which he has occupied since its formation in 1927 by the amalgamation of F. & A. Parkinson, Ltd., with Crompton & Co., Ltd. Mr. Parkinson will remain chairman of the company and, in accepting his resignation as a joint managing director, the board records its appreciation of the outstanding services he has rendered to the company.

Mr. F. H. Beasant, B.Sc.(Hons.), M.I.E.E., M.I.Mech.E., is leaving Crompton Parkinson, Ltd., to join the board of the Anti-Attrition group of companies.

Mr. J. Watson has, for health reasons, relinquished his duties as manager of the Cardiff supplies division branch of the company. In due course he will take up a post in the lighting section in London. **Mr. S. R. Edwards** has been appointed manager at Cardiff as from 1st April. He was formerly manager of the supplies division depot at Portsmouth. He joined Crompton Parkinson in 1933 as London salesman in the lamps and cable department and went to Portsmouth in 1946.

Mr. P. D. Canning has been elected chairman of the Radio and Electronic Component Manufacturers' Federation in succession to **Mr. H. V. Slade.** Mr. Canning, who joined the Plessey Co., Ltd., in 1933, and was for some years responsible for development and production of transmitting and similar apparatus and for radio installation work, has, since 1948, been engaged on special duties connected with trade association activities and overseas liaison for Plessey. He is a member of the Radio Industry Council and chairman of the Technical Directive Board.

Mr. P. D. Canning

Mr. C. A. Hughes, the new chairman of the Electric Light Fittings Association, is a well-known figure in the lighting world as a director and sales manager of Siemens Electric Lamps and Supplies, Ltd. Mr. Hughes was born in London in 1891 and was educated at the Stationers' Company School. He joined Siemens in 1911 and was manager of the Lamp Department from 1924 to 1938. He was appointed sales manager in 1938 and became a director last year. He was chairman of the Electric Lamp Manufacturers' Association in 1939-40 and again in 1950-51, and president of the Electrical Trades Commercial Travellers' Association in 1948. From 1910 to 1919 he served in the London Electrical Engineers (T.A.). Mr. Hughes is an associate member of the Institution of Electrical Engineers and a Fellow of the Illuminating Engineering Society.

At a meeting of members of the Electric Water Heater Manufacturers' Association, held on 20th March, **Mr. F. L. Humber** (Ferranti, Ltd.) was appointed chairman of the Association for the current year, in succession to **Mr. Raymond Berry,** and **Mr. K. R. Taylor** (Santon, Ltd.) was appointed vice-chairman.

The Ampère Medal presented by the Société Française des Electriciens has been this year awarded to **Monsieur H. André,** the inventor of the modern form of silver-zinc accumulator, of which the Commonwealth rights are held by Venner, Ltd.

Mr. Bertram White, technical director of the Federation of British Industries, resigned on 31st March to take up an industrial appointment. **Mr. J. E. G. Harris,** D.Sc.(Lond.), B.A.Cantab., has succeeded him temporarily as acting technical director. Dr. Harris has had a long association with Imperial Chemical Industries, Ltd., from whose service he has now retired.

Mr. F. J. Fielding, managing director of Heenan & Froude, Ltd., has been appointed to the additional position of deputy chairman of the company. As we have already reported, **Mr. C. L. Hill,** previously deputy chairman, has been elected chairman in succession to the late Mr. A. P. Good.

Mr. Norman Readman has been appointed managing director of the Consolidated Pneumatic Tool Co., Ltd., in succession to **Mr. J. A. Owen,** who has expressed the wish to resign from that position after completing fifty years' service with the company. Mr. Owen will continue as a director and technical consultant.

Mr. H. T. Tomlinson, A.M.I.E.E., has been appointed deputy chief electrical engineer to the War Department, Aldershot District.

Mr. F. H. Williams, B.Sc.Tech., M.I.C.E., M.I.E.E., retired on 31st March from the position of hydro-electric engineer, South West Scotland Division, British Electricity Authority. Mr. Williams was educated at the Manchester Grammar School and the College of Technology, Manchester University. His first appointment, in 1908, was that of engineer-in-charge at the Marylebone power station of the Great Central Railway Co. In 1910 he had charge of the testing laboratory of the Manchester Electricity Department, and in the following year joined Switchgear & Cowans, Ltd., later becoming their works manager. He joined the staff of Messrs. Merz & McLellan in 1914 to take charge of the inspection of electrical plant in connection with power and railway electrification schemes and remained with them until 1934.

Mr. F. H. Williams

When the first stage of the Galloway Water Power Co.'s scheme was nearing completion in that year, he was appointed manager of the company, and was responsible for the starting up and operation of the stations and the maintenance of the civil engineering work and generating plant. He held that appointment and was also a director of the company when it became vested in the B.E.A.

Mr. P. V. Gurr, J.P., Folkestone district manager, South Eastern Electricity Board, as representative of the Folkestone Chamber of Trade, has been elected chairman for the ensuing year of the Railway/Traders' Panel for Kent, Surrey and Sussex, set up under the Railway Act, 1921.

Three part-time members of the Yorkshire Electricity Board whose term of office expired on 31st March have not been reappointed. They are **Mr. H. F. Sherborne,** M.C., M.A., Companion I.E.E. (Leeds), a director and manager of the Yorkshire Copper Works, Ltd.; **Mr. A. R. Baines,** C.B.E., chairman and managing director, William Baines' Sons, Ltd., woollen manufacturers, Morley; and **Councillor H. Fairbotham,** J.P. (Hull). The fourth member, **Alderman J. H. Bingham,** J.P., leader of the Labour members of Sheffield City Council, has been reappointed for another twelve months.

Mr. J. W. Rodger, M.I.E.E., managing director, Bruce Peebles & Co., Ltd., accompanied by his wife, returned from Uganda on 28th March after a six months' tour embracing Canada, New Zealand, Australia, Tasmania, Ceylon, India, Pakistan and Southern, Central and Eastern Africa.

Mr. A. H. Carmichael has been appointed director of the Cable Makers' Association in succession to Sir John Dalton, now chairman of W. T. Henley's Telegraph Works Co., Ltd. He has had much experience in legal, electrical and metallurgical affairs and has been director of the Brass and Copper Tube Association for the past sixteen years.

Mr. Carmichael was educated at George Heriot's, Edinburgh, after which he studied law and was called to the Bar of the Middle Temple. He specialized in contract law, patent law and the law relating to trade associations. In the 1914-18 war he served in France as a captain in the Royal Scots. Mr. Carmichael's seventeen years' experience in the electrical industry has included five years with the International General Electric Co. and seven years with the British Thomson-Houston Co., Ltd. During his sixteen years as director of the Brass and Copper Tube Association he has gained much experience in negotiations with Government Departments and trade bodies. His activities have taken him to many parts of the world.

The Eastern Electricity Board has merged the districts of Finchley and Hornsey as from 1st April, and the new district, which covers the boroughs of Finchley and Hornsey and the urban district of Friern Barnet, has its headquarters at Crouch End Broadway, N.8. **Mr. C. Bradley,** M.I.E.E., at present manager of the Finchley district which already includes Friern Barnet, has been appointed manager of the new Hornsey district.

Mr. C. Bradley

In 1931 Mr. Bradley was appointed by the Dumfries County Council as constructional engineer in connection with the county electrification scheme. He eventually became sales engineer to the County Council and went to the Finchley electricity undertaking in 1936 as consumers' engineer. In January, 1943, he was appointed deputy to the general manager and engineer, and was finally appointed general manager and engineer immediately prior to nationalization.

Councillor N. E. Brown, an electrician employed by the North Eastern Electricity Board, is to be Mayor of Stockton-on-Tees during the coming municipal year.

Mr. R. S. Atkinson, A.M.I.Mech.E., A.M.I.E.E., Group I generation engineer (operation) in the London Division of the B.E.A., has been appointed chief generation engineer (operation) in the Merseyside and North Wales Division. He succeeds Mr. R. L. Batley, O.B.E., now controller of the Midlands Division.

Educated at Rutherford College and Rutherford Technical College, Newcastle-upon-Tyne, Mr. Atkinson served a five years' engineering apprenticeship and subsequently had eight years' industrial and marine engineering experience on the North-East Coast. He was with the Hull Electricity Department from 1929 until 1936 when he became a shift charge engineer in the Bradford Electricity Department; a year later he took up a similar post at the Yorkshire Electric Power Co.'s Ferrybridge power station. From 1942 to 1945 he was power station superintendent with the Lincoln Electricity Department and for the next four years held a similar appointment at Rotherham. Mr. Atkinson joined the South Eastern Division of the Authority in 1949 and two years later took up his present position with the London Division.

Mr. J. A. Fraser informs us that he has left the English Electric Co., Ltd. (Domestic Appliance Division). His home address is 6, Capel Gardens, Pinner, Middlesex.

Mr. E. H. Maltby, general manager of the Sloan Electrical Co., Ltd., has now joined the board.

On 21st February last a festival of one act plays was staged in the "Little Theatre" of the Valley Road power station, Bradford. Taking part were teams from Hull, Huddersfield and Bradford areas of the **Yorkshire Electricity Board,** and the latter's entry of two teams (one from the Board and the other from the Division) made four teams in all competing for the drama shield. The adjudicator, Mr. J. Berry, of Huddersfield, gave the award to the Hull group. Among those who attended were Mr. Bellamy (chairman, Y.E.B.), Mr. Bond (deputy chairman) and Mr. Vickers (generation engineer, operation) and Mr. Shaw (Bradford station superintendent, Yorkshire Division) and their ladies. Mr. Bellamy presented the trophy to the Hull group.

The **Lessa Music Society** of the London Electricity Sports and Social Association gave an excellent choral and orchestral concert on 31st March at the St. Pancras Town Hall. The choir master was Mr. D. Sharpe and the conductor Mr. L. Atkins. The varied programme, which consisted mainly of well-tried favourites, opened with Schubert's "Rosamunde" overture, and other works in the first half included a suite from "Carmen," Percy Grainger's "Handel in the Strand" (pianoforte, Arthur Whitehead), and Weber's "Invitation to the Dance" (with choir). The Society warmed up as it progressed, and in Schubert's "Unfinished" symphony the orchestra gave a very satisfying performance. The choir gave three groups of part songs and was, perhaps, at its best in three negro spirituals. Dances from "Prince Igor" (choir and orchestra) were an exciting finale to a well-balanced programme which enhanced the already considerable reputation of the Society.

OBITUARY

Mr. W. J. Hamilton, for many years Cardiff branch manager for the Electric Construction Co., Ltd., Wolverhampton, died on 30th March.

Mr. J. L. L. North.—The death occurred recently after a short illness of Mr. John Leonard Lauraine North, sales director of the Static Condenser Co., Ltd.

WILLS

Mr. A. P. Good, deputy chairman of the Brush Electrical Engineering Co., Ltd., chairman of Heenan & Froude, Ltd., and their associated companies, and of Associated British Engineering, Ltd., who died in South Africa on 10th February last, left £515,958 gross (£42,586 net).

Mr. S. R. Roget, B.A., A.M.I.E.E., president of the Huguenot Society, who produced the latest edition of Roget's "Thesaurus of English Words and Phrases," and who was grandson of the compiler of the original Thesaurus, died on 17th November last, leaving £98,094 gross (£96,517 net).

Mr. W. C. Labrum, district engineer at Horsham to the British Insulated Callender's Construction Co., Ltd., who died on 2nd February, left £7,483 gross (£7,316 net).

Mr. N. Brooksbank, M.I.E.E., formerly for some years chief London engineer to the Victoria Falls & Transvaal Power Co., who died on 5th December last, left £45,823 gross (£45,520 net).

Mr. W. T. Gibson, O.B.E., M.A., B.Sc., M.I.E.E., chief valve engineer, Standard Telephones & Cables, Ltd., who died on 27th December last, left £9,309 gross (£9,061 net).

Mr. P. H. Rolfe, formerly with the British Thomson-Houston Co., Ltd., who died on 29th September last, left £7,192 gross (£2,962 net).

Mr. J. W. Reid, late a director of Berry's Electric, Ltd., and manager of the Wembley Works, 1928-45, who died on 15th December last, left £4,047 gross (£3,912 net).

Lighting Fittings Makers

Justification of Trade "Rings"

At the annual luncheon of the Electric Light Fittings Association held at the Piccadilly Hotel, London, W.1, on 31st March, the president, Mr. K. Scott Adie, took the chair. Sir Vincent de Ferranti was the principal guest and proposed the toast of the Association.

In the course of his speech Sir Vincent, after some references to early electric lighting installations, turned to the subject of trade "rings" for which, he said, he was a great enthusiast. It was for lack of such combinations that the British electrical industry "went broke" in 1903. An industry could not be run properly without rings and therefore the Monopolies Act was a folly; the Commission wasted much time and would do harm rather than good. It could, of course, be used to educate the public into the necessity for rings. Orderly development could not be achieved without co-operation. Since 1903, by co-operation, there had been a great story of development in the electrical industry.

The Association's annual report indicated an amazing variety of activities. It was not possible to attain or maintain co-operation without a great deal of hard work and E.L.F.A. could not have done what it had without much hard work on the part of its president.

Acknowledging the toast, Mr. Scott Adie said that there appeared to be a strong "anti-association" complex in the minds of certain people and it was possible that this would result in something like a "witch hunt." He was at a loss to know why the sensible co-ordination of industry was being attacked. From his lifelong experience in the electric light fittings industry he could say without hesitation that the customer had benefited considerably by the work and ideals of the electrical trade associations. Moreover, responsible Government officials welcomed the existence of a representative body with which important matters could be discussed and through which quick action could be taken.

The president quoted as an example the inauguration of the National Industrial Electric Lighting Service in 1940 when a joint committee, under the chairmanship of Sir Duncan Wilson, on which trade association representatives were preponderant, secured immediate co-operation of all the associations concerned. The result was, as stated by the Chief Inspector of Factories, that the improvement in industrial lighting was perhaps the most striking wartime change in working conditions. That could not have been achieved if the electrical industry had comprised a large number of unorganized individualists.

Another example of the value of trade associations was in the distribution of raw materials. E.L.F.A. was one of the first, if not the first, trade association to accept the responsibility of taking over a bulk

From left to right: Messrs. H. S. Pocock and J. H. Campion (secretary); Sir Vincent de Ferranti; Messrs. K. Scott Adie, T. M. Adie and A. B. Wildsmith

allocation of materials and distributing them to its own industry.

It was his sincere conviction that if the activities of electrical trade associations were curtailed the retardation of progress would be detrimental to all.

The health of the guests was proposed by Mr. A. E. Iliffe in an amusing speech. He referred particularly to Mr. Scott Adie's father, Mr. T. M. Adie, who was again at the luncheon, Col. B. H. Leeson, President I.E.E., and well-known representatives of kindred associations.

Mr. H. S. Pocock replied for the guests in similar vein but concluded by seriously thanking the members of the Association for their work in brightening homes, preventing accidents and increasing production.

Mr. C. J. W. Scott proposed the toast of "The Past-Presidents." He said the Association owed much to its hard-working honorary officials. He made appreciative references to the eight past-presidents and paid special tributes to the first president, Mr. J. N. Stephens, and to Mr. Scott Adie and Mr. A. J. Burbidge. Mr. Burbidge responded to the toast.

ANNUAL REPORT

The president's report for 1952, which was presented at the subsequent annual meeting, said that during the past year the electric light fittings industry had fared reasonably well. The production of industrial and street lighting fittings had continued on a very high level but the position in the Commercial and Decorative Lighting Sections had not been quite so happy, mainly because of purchase tax.

The Association had continued to administer

Mr. T. W. Heather and Col. B. H. Leeson

Messrs. A. E. Iliffe and C. Hughes

the Government allocations of steel, blackplate and tinplate but the inadequate steel supplies had made it necessary for members to use alternative materials. This had hampered the industry in its efforts to maintain economic production and prices—particularly in the case of fluorescent lighting. It was to be hoped that the promise of adequate steel supplies this year would mature.

As a result of pressure by E.L.F.A. and other trade associations concerned, the bans on the use of copper, brass and zinc had been removed, although there was still a limitation on the use of nickel plating.

High taxation was hindering industrial development in this country and restrictions on capital expenditure were adversely affecting the modernization of industry — which might account for any slight recession in the demand for modern industrial lighting. Purchase tax continued to weigh heavily on domestic and commercial lighting fittings. The Ridley Committee had recommended the removal of purchase tax from fluorescent lamps and the Association had pressed the Chancellor of the Exchequer to remove it from fluorescent lighting fittings also.

Dealing with the Electrical Fair Trading Policy, Mr. Scott Adie defended the grading of the industry's various customers for discount purposes, saying that undue inflation of net prices could only be avoided by an organized system by which discounts were equitably proportioned according to distribution services rendered.

A tribute was paid to the Association's Technical Committee for its work which benefited the rest of the industry.

E.L.F.A. members had continued their efforts to increase exports and there had been a substantial improvement in the sales of lighting equipment overseas last year. There were

prospects that the Australian ban on imports would be lifted in the near future. Increasing foreign competition in overseas markets required to be watched, particularly that from certain subsidized German industries.

After a reference to the continuance of good relations with other bodies, the report showed that the membership of 45 was distributed as follows (some members being in more than one section):—Decorative Fittings Section, 26; Commercial Fittings Section, 29; Industrial Fittings Section, 34; and Street Lighting Fittings Section, 17. The report briefly reviewed the activities of each section.

As regards decorative lighting fittings, on E.L.F.A.'s advice certain classes of fittings specially designed for churches, public buildings and other non-domestic and non-office premises had been exempted from purchase tax, subject to the fulfilment of certain conditions. It was hoped that the recent relaxation of building restrictions would be of material assistance to both the Decorative and Commercial Fittings Sections.

In spite of the shortage of steel and the use of more expensive substitutes, the total sales of industrial fittings appeared to have constituted a record.

In collaboration with recognized street lighting erection contractors considerable progress had been made towards the establishment of a strict Code of Practice for street lighting erection work and the adoption of British Standards where they applied. The gas industry in a memorandum to the Ridley Committee had conceded that the electric discharge lamp had a greater efficiency than the incandescent gas mantle and that it therefore did not seek extension of its responsibility for street lighting.

PARLIAMENTARY NEWS

By Our Special Reporter

REPLYING to questions in the House of Lords last week the Postmaster General (Earl De La Warr) said the Government intended to carry out its policy of competitive television at the earliest possible moment. Major capital development of television, whether by the B.B.C. or other potential broadcasters, was not being held up for lack of a controlling body, but solely because in this and other spheres it had hitherto been necessary for the Government to devote resources to defence and exports. The reconstituted Television Advisory Committee had done an important job in examining the technical problems involved and he hoped to receive its report by this month or early May. His intention was that the report should be published, and the information would be made available to the radio industry without delay. It was his firm intention that the controlling body should be set up sufficiently ahead so as to be able to survey its problems and responsibilities well before it was asked to function.

In the House of Commons the Assistant Postmaster General (Mr. Gammans) said that from next year there was no reason why sets should not have a device enabling viewers to switch from the B.B.C. programme to sponsored programmes. The Television Advisory Committee would advise what frequency bands would be available for sponsored television stations. He saw no reason why manufacturers should not, at a very early date, have the necessary information to enable them to undertake the development and design of the new sets which would pick up the new stations. From the B.B.C.'s point of view, competition would prove to be a good thing.

Air-Conditioning Plant

Mr. Molson, Parliamentary Secretary, Ministry of Works, told Major Markham that the air-conditioning plant of the House of Commons enabled the air in the Chamber, the immediately adjoining lobbies and in the two floors below to be maintained at a fairly steady temperature. Normally the temperature was 66 deg and the relative humidity 55 per cent. In the course of late sittings the temperature was gradually raised so that it probably reached 70 deg by about 6 a.m. The air in the Chamber was completely changed six times each hour. As soon as a division was called, the influx of air was directed into the "Aye" and "No" lobbies. It was difficult to avoid a substantial increase in temperature if several divisions followed immediately as ten human bodies had the same heating effect as a 1 kW electric fire.

Kafue Power Scheme

Mr. Dodds-Parker asked the Secretary of State for the Colonies whether, in view of the fact that the Owen Falls Scheme would cost double the original estimate, he would appoint a committee to examine the cost of £27 million for the Kafue scheme before placing contracts.

Mr. Lyttelton said he had not yet received the report of the Kafue power scheme and the Governor's comments upon it, but the estimate of expenditure would be most carefully examined before any contracts were placed.

Metallurgical Research

Work of the British Non-Ferrous Metals Research Association

SINCE the new laboratory block at the London headquarters of the British Non-Ferrous Metals Research Association was opened three years ago the equipment has been brought into full use and these additional facilities have enlarged the scope of the Association's research activities. The Institute of Metals has chosen the laboratories as one of the establishments to be visited during the spring meetings and a few days ago we had the opportunity of inspecting the laboratories.

The Association offers its members three main services. First, a laboratory and organization for conducting co-operative research and exchanging technological information; secondly, a free, confidential consulting service to give assistance with individual technological problems; and thirdly, an up-to-date information service and library covering the world literature on non-ferrous metallurgy. There are at present 42 major research projects under investigation in the laboratories. Last year members received help in connection with about 980 technological problems, and the library sent out nearly 10,000 loans in response to members' requests for information.

Researches in progress at the moment range from the effect of detergents on zinc alloy diecastings used in washing machines, to the evaluation of the properties of titanium and its alloys. This metal is as strong as steel but only half as heavy. It has a high melting point (1,700 deg C) and in the laboratories it is usually melted in an arc furnace in vacuum or in an atmosphere of argon. It is so reactive that it alloys readily with the oxygen and nitrogen of the air or with carbon if this is used for melting pots. These elements can all act as hardening agents in titanium in a way somewhat similar to the hardening of steel by small amounts of carbon, so it is important to know if these elements are present. The laboratories have a section specializing in the analytical techniques needed for determinations of this kind, including the vacuum extraction and analysis of gases present in metals.

The prevention of corrosion plays an important role in the Association's programme. The successful working of the marine steam turbine depends to a large degree on work on condenser tube materials carried out in the laboratories over the past 25 years. New problems have arisen where tube materials are in use in power stations and oil refineries built on river estuaries in which the water is heavily contaminated with industrial waste, and further research has still to go on.

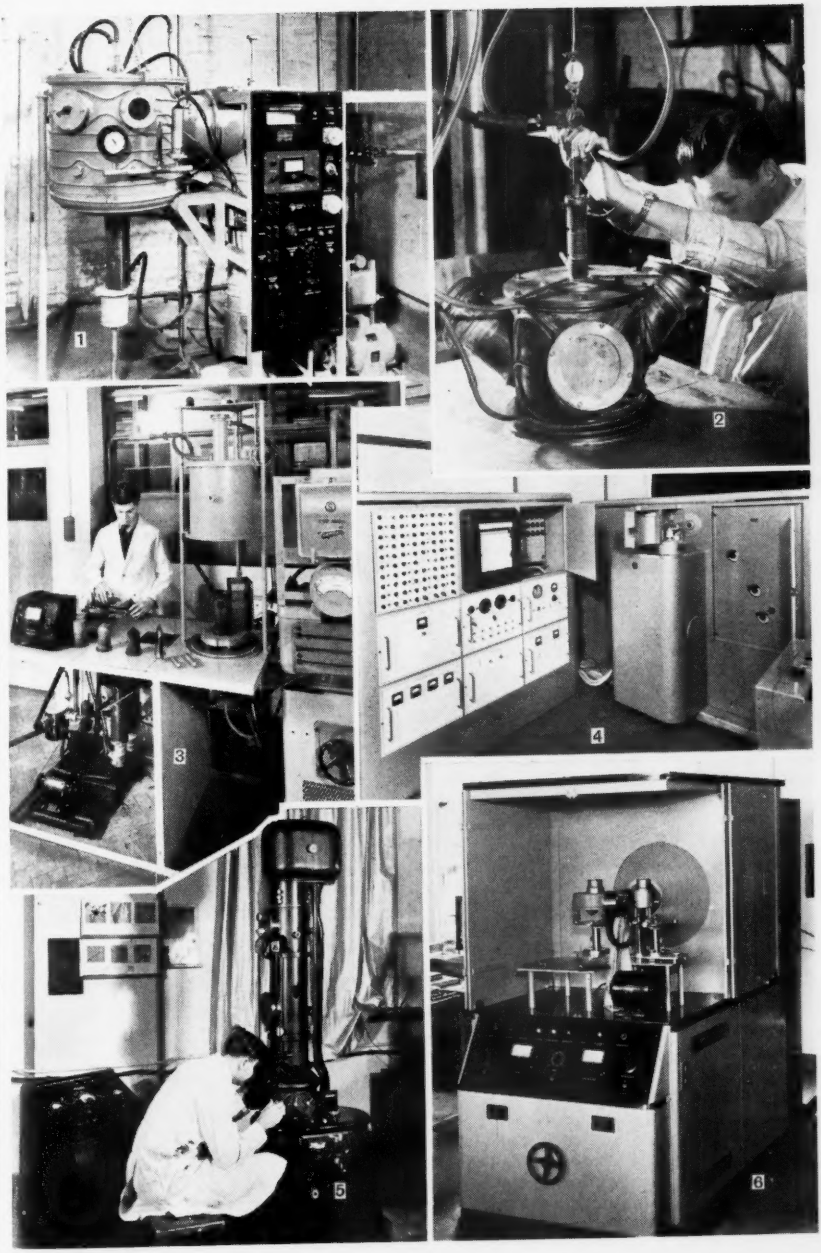
An extensive investigation has just been made into the failures of copper domestic water pipes through pitting corrosion which occurs occasionally in a few parts of the country. This has been found to be due to the presence of a carbon deposit on the inside of the copper tubes and the absence of an organic substance normally present in small amounts in most water supplies which has the effect of stifling corrosion.

Other work on corrosion is concerned with the use of aluminium alloys, one important aspect being the protection of underground aluminium sheathed cables.

Investigations have also been made into the problems arising from the shortage of both non-ferrous metals and sulphuric acid used for pickling metals during processing. In the latter connection, practical recommendations have been made for economizing in sulphuric acid and saving copper.

Equipment at the British Non-Ferrous Metals Research Association Laboratories

(1) Electric furnace for melting and casting under high vacuum. (2) Arc melting titanium alloys in an atmosphere of argon. (3) Split graphite tube resistance furnace for melting and casting titanium alloys under high vacuum. (4) The "Quantometer," a direct reading spectrometer and recorder. (5) Electron microscope capable of magnifications up to 100,000 times. (6) High power rotating anode X-ray generator for crystallographic examinations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From the basic knowledge of the galvanizing process which had been established as a result of past research work, suggestions have also been made for reducing the consumption of zinc without detriment to the quality of the galvanized article. In one firm's works this has reduced zinc consumption by about 15 per cent.

The zinc shortage was only temporary, but nickel is still scarce. The Association is assisting by acting as a test-house for evaluating the several substitutes for nickel plating that have been put forward and by carrying out research to improve the quality of electroplating so that thinner, but equally protective, nickel coatings may be produced. The metal finishing section of the laboratories is also working on the electroplating of light alloys. Several methods of plating on aluminium have been tested and it seems likely that one of the processes at present used commercially in a limited way can be simplified and improved to form the basis of an automatic plating installation.

The increasing use of aluminium alloy pressings has revealed the susceptibility of some of these alloys to strain markings which mar their appearance. Various ways of suppressing this effect have been developed, such as controlling the grain size of the material or finishing the sheets by a light rolling and heat treatment. The evolution of the gas turbine has led to a demand for alloys also to resist corrosive conditions at high temperatures. A group of copper alloys, the aluminium bronzes, which can easily be forged are being used extensively as compressor blades in these engines and the long-term properties of these alloys at high temperatures have had to be established to provide data for the turbine engineer.

The Association has long held a leading position in the field of techniques for the spectrographic analysis of metals, a rapid method of analysis in which the composition of a metal is determined from the intensity of the lines in the spectrum which is produced when an electric discharge is passed between a rod of the metal and another electrode. To the existing three spectrographs in the laboratories there has recently been added an American "Quantometer," a direct reading spectrograph capable of estimating up to 16 elements in a given sample within a few seconds. The instrument, which occupies a whole room, is being used to develop methods for the analysis of copper and its alloys, a use to which it has not previously been applied.

Among other electronic equipment is an electron microscope capable of magnifications up to 100,000 times, electron-diffraction equipment for identifying surface films on metals and X-ray equipment for investigating crystal structure. The laboratories also contain a foundry, rolling mill, draw bench, forging and extrusion plant, as well as the more usual metallurgical, chemical and corrosion laboratories.

Power Station Efficiencies

THE British Electricity Authority claims that the increase in the efficiency of its power stations last year resulted in a saving of over 1,300,000 tons of coal and over £3,000,000 in terms of expenditure. The overall average thermal efficiency of these stations (nearly 300) for the calendar year 1952 was 22·61 per cent, compared with 21·79 per cent in 1951. The following were the twenty steam stations with the highest overall thermal efficiencies for 1952:—

Station	Thermal efficiency, per cent
Littlebrook "B," Dartford, Kent	29·95
Dunston "B2," Newcastle-upon-Tyne	29·65
Portobello H.P., Edinburgh	29·46
Skelton Grange, Leeds	29·19
Bromborough, Ches	28·88
Stourport "B," Worcs	28·84
Battersea "B," London	28·71
Poole, Dorset	28·31
Braehead, Renfrew	27·79
Agecroft H.P., Salford	27·20
Blackwall Point, London	26·66
Clyde's Mill H.P., Glasgow	26·66
Fulham, London	26·63
Cliff Quay, Ipswich	26·63
Stuart Street H.P., Manchester	26·47
Brimsdown "B" H.P., nr. Enfield	26·41
Hams Hall "B," nr. Birmingham	26·24
Llynfi, nr. Bridgend, S. Wales	26·23
Staythorpe, Newark	26·18
Croydon "B," Surrey	26·02

Three stations, Brunswick Wharf, North Tees "C" and Huncoat, which did not operate throughout the whole year, achieved thermal efficiencies for their periods of commercial operation of 28·41, 26·93 and 26·60 per cent, respectively.

New power stations and new plant in older stations make a highly important contribution to national fuel economy. Well over one-tenth of the Authority's present total output capacity is provided by plant over 25 years old. The replacement of these old machines will save substantial quantities of coal and money.

The present plant programmes of the Authority aim to reach an overall average thermal efficiency of 26 per cent in 1960.

VIEWS on the NEWS

By REFLECTOR

SO convincingly was the case for electricity put at the recent annual meeting of the Middleton (Lancs) branch of the Electrical Association for Women that the Mayor (Councillor Mrs. N. Chisholm), who was present, declared that although a member of a Gas Consultative Council she intended to become an "electrical woman." Credit for this conversion is apparently due mainly to Lady de Ferranti, who was the principal speaker at the meeting, although according to another speaker the secretary's persuasive report had something to do with it.

* * *

Starlings seem to have become the most unpopular of birds and in towns, at least, every man's hand is against them. Electricity has been called in to assist in getting rid of them but not, I am glad to think, to exterminate them. They are merely discouraged from settling and deafening citizens with their shrill chorus. One concern, aptly named De-Birding, Ltd., provides a system in which pulses at one-second intervals are sent through a wire, on insulators, installed at the birds' usual perching places. The company claims that "news spreads rapidly in the bird world and the building is soon shunned by all comers."

* * *

Like most people, I had the idea that the term "nutty slack" was a recent inspiration of some bright employee of the National Coal Board. I was quite taken aback when I accidentally hit upon the description in the *Electrical Review* of 9th November, 1906. It occurred in a comparison between two dry-back marine boilers, one hand fired with "best hard steam" coal and the other served by a Bennis stoker with "nutty slack." As I said last week, this is the way to use the stuff—not for domestic fires.

* * *

According to the Manchester *Evening Chronicle*, the North Western Electricity Board's short-wave radio system recently enabled its service staff to carry out a remarkably speedy repair. A Levenshulme consumer, finding that his water taps were "alive," phoned the Board from a nearby telephone kiosk and (to quote the report): "By the time he had replaced the phone and turned round to leave the box he could see the Board's service van drawn up outside his home." The call was made at 12.55 p.m. and by 1 p.m. the fault had been corrected and the van was on its way. Even the Americans will find this difficult to excel.

* * *

From a letter in the *Financial Times* of 26th March:—

> "It will be interesting to see how the stags fare in this week's North of Scotland Electricity Loan flotation. If I am not mistaken their applications will be welcomed."

Landseer could have derived inspiration from this.

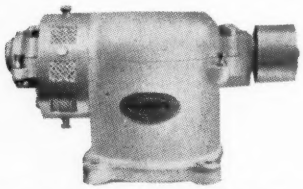
CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Early D.C. Motors

I DO not think Mr. Theodore Rich is quite fair to some British manufacturers in suggesting (in the *Electrical Review* of 27th March) that the early motors made by the C & C Electric Motor Co. were so far in advance of machines available in this country.

The first Scott motors, made in 1883, had slotted armatures and very early in the 1890's a machine was made which, as you



A protected d.c. Scott motor of the 1890's

will see from the attached illustration [reproduced herewith], was very adequately protected and was also available totally enclosed. Flange-mounted motors for individual drives were introduced at about the same time.

London, W.C.2. T. J. BARFIELD,
Publicity Manager,
LAURENCE, SCOTT & ELECTROMOTORS, LTD.

Farmers' Tariffs

WITH regard to "Reflector's" remarks on the South Western farmer who was changed over to the farming tariff as a result of his use of electricity for shearing a small flock of sheep (*Electrical Review*, 20th March), I should like to point out that the tariff does make provision in such a case for a farmer, if he wishes, to have his supply for farm purposes separately metered. In this case his domestic assessment would remain unchanged and the few units he consumed for shearing would be chargeable at 5d/kWh.

"Reflector's" remarks, however, do help to pin-point a very important aspect of rural electrification, i.e., the need for farmers to make a much more extensive use of electricity on the farm. The South Western Board is connecting 25 farms a week to the public mains, but only a greater use of electricity for farming purposes can justify the high rate of capital investment necessary to bring these supplies.

Bristol. W. HUCKER,
Information Officer,
SOUTH WESTERN ELECTRICITY BOARD.

Technological Training

THE need for the training on a wide basis of the technicians of the future was emphasized by Mr. J. Eccles, C.B.E. (chairman of the Merseyside and North Wales Electricity Board and a vice-president of the Institution of Electrical Engineers), at the annual dinner of the North Staffordshire Sub-Centre of the Institution, held on 27th March. The dinner was held at the Crown Hotel, Stone, Mr. J. H. Pirie (chairman of the Sub-Centre) presiding.

Proposing the Institution, Dr. A. T. Green, O.B.E. (Director of Research, British Ceramic Research Association), referred to the connection between the ceramic and the electrical industries. Considerable advances had been made in the study of ceramics, which had a particular application to the electrical industry. Mr. Eccles, in responding, said that unless we could provide better equipment at lower prices and at better delivery times, hope of survival was going to be extremely limited. In education a movement had been made in the right direction with the extension of the Imperial College of Science; it was hoped that twelve regional colleges of technology would be created where students of the industry would have six months' technical training on a wide basis, followed by six months in the works. Colonel C. E. Calveley, O.B.E., A.D.C. (vice-chairman of the Sub-Centre and principal of the Post Office Engineering Training School), proposed the toast of the guests, and Mr. J. H. Parker Oxspring, M.B.E. (Director of Education for Staffordshire), replied.

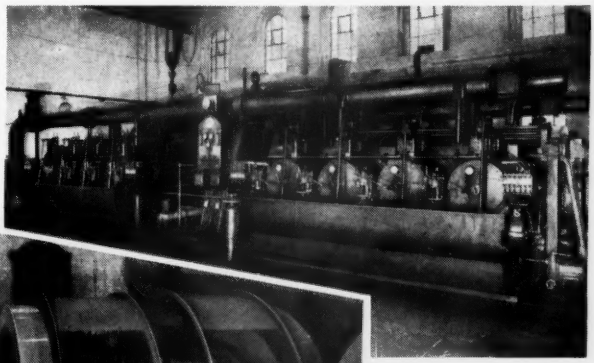
Developments at Bushbury

Concentration on Long Life and Reliability of Products

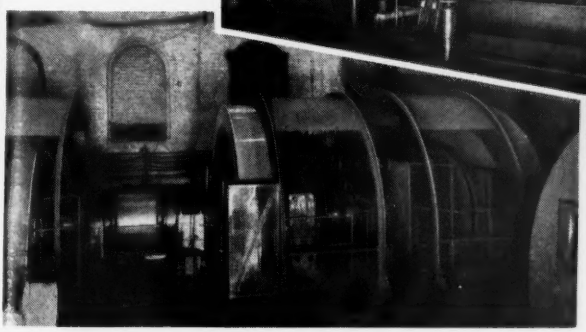
THOUGH having a history dating back over seventy years, the Electric Construction Co., Ltd., has lost none of its vitality in exploring new opportunities for development. Besides providing a chance to see some of its latest achievements, a recent visit to the Bushbury Engineering Works, Wolverhampton, emphasized to us the value of the company's consistent concentration on high quality and reliability.

The company has always been a pioneer in the application of electricity to industry, as well as traction. A link with the E.C.C.'s early days, as well as a typical example of the standard of workmanship adopted, was to be seen in the heavy rotating electrical machinery erecting shop where a cogging mill generator, installed in 1908, was undergoing modification to give a larger output. Before returning to the factory this generator had been supplying a cogging mill motor dealing with normal peaks of 4,800 h.p. and momentary peaks up to 9,600 h.p. at a speed of 0 to ± 120 r.p.m. through a 2:1 reduction gear. The generator is part of the original Ward-Leonard-Ilgner set which comprised a 2,000 h.p. 460 V d.c. motor, two 0 to ± 1,000 V generators and two 14ft diameter, 28 ton flywheels running at a speed of 290/350 r.p.m. and which is still operating satisfactorily.

Further instances of longevity of E.C.C. machines are provided at the same works as those in which this motor-generator and cogging mill are employed, the Stewarts and Lloyds blast furnace and hot rolling mill at the Alfred Hickman Works, Bilston. Here are still in constant use three 250 V 150 kW 450 r.p.m. multipolar d.c. generators installed in 1903, and two 250 V 235 kW 140 r.p.m. generators installed in 1905. To work in conjunction with these machines a new three-wire 675 r.p.m. booster set has been installed to provide a 500 V supply, the outer wires giving 2,000 A and the



Right: **1,750 kW 500 V 214 r.p.m. generator mounted between two halves of a Crossley-Premier 16-cylinder oil engine at the Bilston works of Stewarts and Lloyds**



Left: **Ward-Leonard-Ilgner set installed at the Alfred Hickman Works, Bilston in 1909 and still running satisfactorily**

middle wire 4,000 A. All these machines, and the three 250 kW, one 300 kW, four 650 kW and one 600 kW 500 V units installed between 1908 and 1939, are blast furnace gas driven. As a further contribution to the generating facilities the E.C.C. in 1939 supplied a 1,750 kW 500 V 214 r.p.m. generator for mounting between the two halves of a Crossley-Premier 16-cylinder oil engine. When first installed this oil engine set ran non-stop for approximately eleven months, and for two years during the war, when blackout restrictions prevented the use of the blast furnace operated plant, it provided a practically uninterrupted supply to the factory.

Plant for Export

As a contrast to these somewhat historic products we were particularly interested to see under test a salient pole synchronous motor generator set for Australia, comprising a 2,580 h.p. motor arranged for 0·95 leading power factor 10,250 V 3-phase 500 r.p.m., coupled on each side to a d.c. generator capable of producing 8,000 A at any voltage from 4 to 110 V. These duplicate generators have twin brushes in tandem, while oscillating gear, giving a movement of 0·15in each way, minimizes wear on the " Combarloy " commutators. The two exciters, one for the motor and one for the generators, are mounted together as a single unit with a fan in between. Forced draught ventilation is provided for the main set. Utilizing the Korndorfer system, an auto-transformer starter limits starting current to 200 A. The d.c. control switchboard includes a circuit breaker and knife switch for each generator.

Two similar sets are in hand for South Africa. Each of these has a 3·3 kV 3-phase 50 c/s 500 r.p.m. 1,065 h.p. motor (0·85 leading power factor) and two generators giving 5,000 A at 70 V and arranged for series or parallel connection.

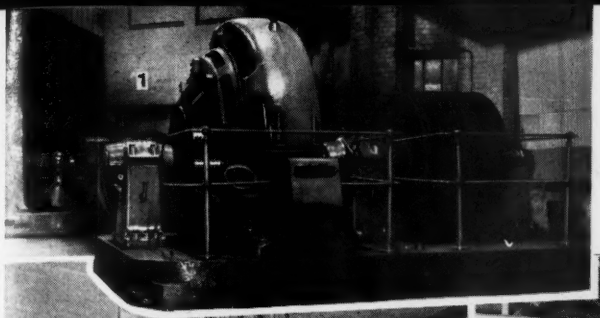
Among other heavy equipment for overseas in course of construction—nowadays about 40 per cent of total production is destined for abroad—was the third of six 6·6 kV 2,280 kVA 250 r.p.m. alternators for the State Electricity Commission of Victoria, Australia. These are of the flywheel type and arranged for coupling to Sulzer diesel engines. There was also one of four 3·3 kV 1,875 kVA 428 r.p.m. diesel engine driven alternators for South Africa to the order of Hubert Davies & Co., Ltd., Johannesburg. Also on order are twenty-three screen protected squirrel cage direct-switching motors for the Mannum water pumping scheme, Adelaide. Four of these are of 650 h.p. and the remainder 1,350 h.p., all running at 1,000 r.p.m. Three 6 kV 815 h.p. 250 r.p.m. synchronous compressor motors have just been completed for Poland.

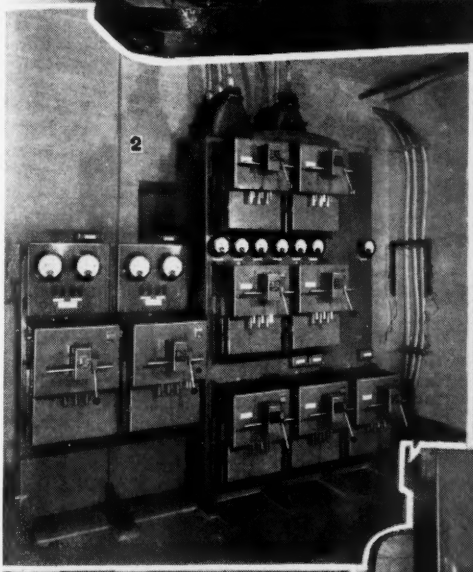
For the South Western Division of the National Coal Board thirty-four large synchronous motors ranging from 570 to 1,450 b.h.p. are in hand for driving compressors. All the machines are for 50 c/s 3-phase supplies, but they are required for different voltages: 3 kV, 3·3 kV, 6·6 kV and 11 kV. Some are designed as dual-voltage machines and are arranged for internal reconnection.

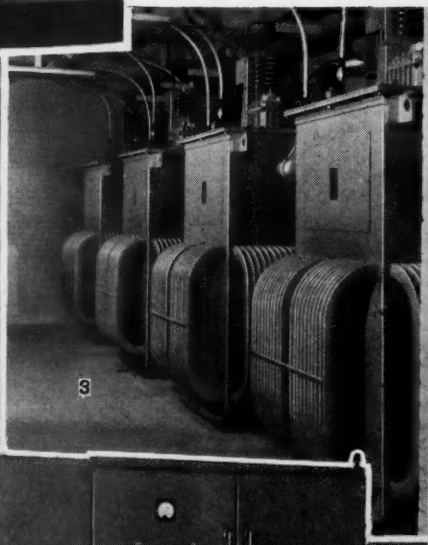
A particularly large number of special motor generator sets were going through the shops for use in the Automatic Telephone & Electric Co.'s " Rythmatic " control equipment and we noticed many units destined for Australia and New Zealand as well as for home towns. With numerous 400 c/s tone inductors, etc., for the General Post Office were several special motor generator sets for telecommunications and telephone exchange power equipments. Special multi-phase apparatus for technical colleges, etc., and high frequency units for electric furnaces were also under construction.

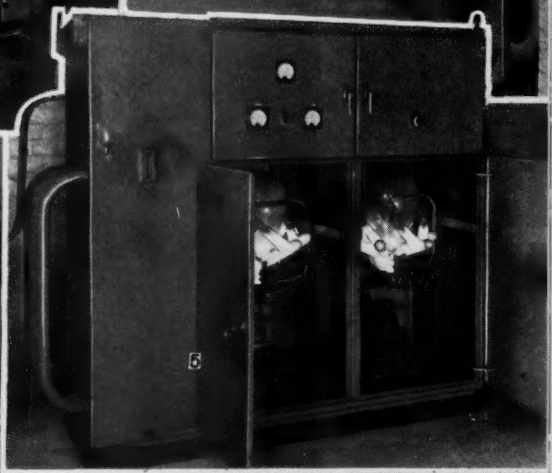
A revolving field alternator set recently ordered for over-potential testing of large transformers in connection with the reorganization of the Test Department at the transformer works of Crompton Parkinson, Ltd., at Hayes, Middlesex, comprises a revolving field type alternator having a capacity of 800 kW 0·8 p.f. 1,000 kVA 1,000/980 r.p.m. designed to give a supply at 11,000 V 3-phase 200/196 c/s, with neutral brought out, direct coupled to a main and a pilot exciter. The alternator is direct coupled to a 1,165 b.h.p. 1,000/980 r.p.m. 6,600 V 3-phase 50 c/s slip-ring motor.

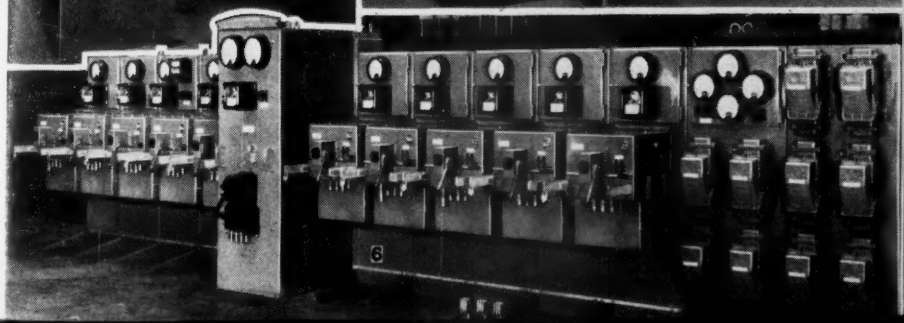
The set, which is designed to give its maximum rated output for five-minute periods every four hours, is controlled by an E.C.C. liquid starter rated for starting the motor against 50 per cent of full load torque. An electrically operated exciter control desk for the alternator field comprises a solenoid operated field breaker together with two motor driven regulators, main and vernier, giving smooth voltage control from zero to



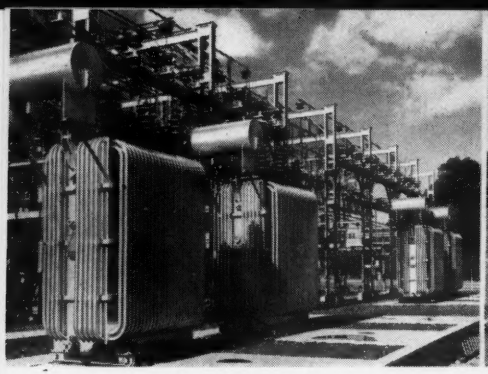


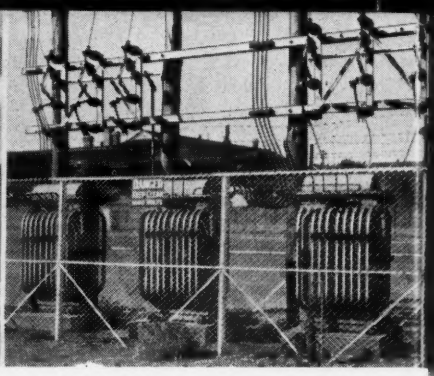




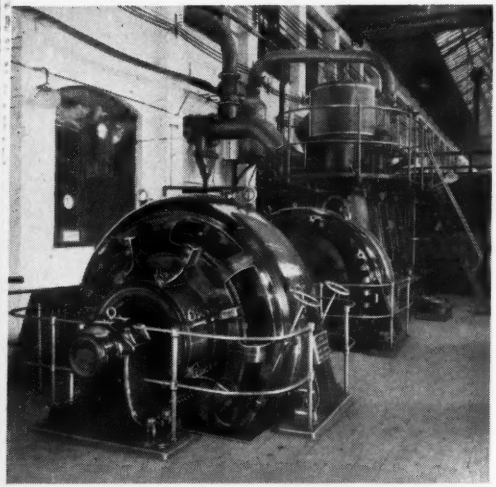


(1) Large d.c. mill motor installed at the works of Bayliss, Jones & Bayliss, Ltd., Wolverhampton. (2) L.v. distribution board installed at the Britool works, Bushbury. (3) Induction regulators at the Trostre works of the Steel Company of Wales. (4) 4 h.p. lifeboat motor with starter mounted in lifting bar. (5) Typical mercury-arc rectifier for general works load. (6) Distribution switchboard recently completed for the North Eastern Division of the N.C.B.

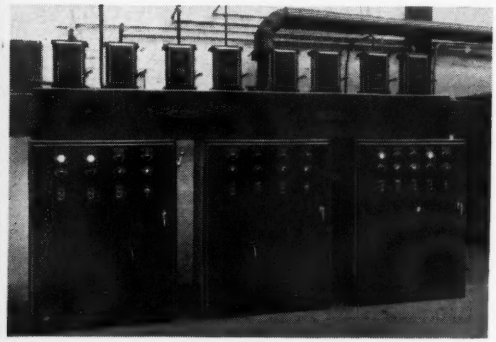




2,000 kVA 33/11·9/3·4 kV outdoor transformers at Oakdale substation, Capetown. *Right:* **Three 100 kVA 11 kV/440 V outdoor transformers at the School of Mines, Kalgoorlie, Western Australia**



Tandem engine alternator and generator set in the E.C.C. engine room. *Below:* **Distribution and control switchgear in the E.C.C. boiler house**

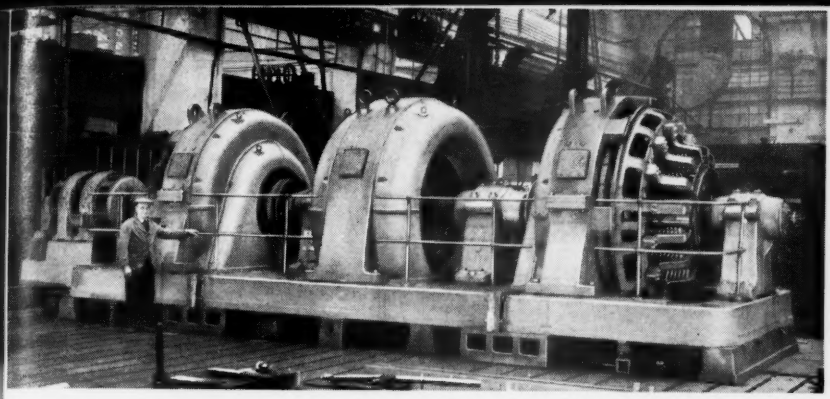


maximum in a multi-range of steps. The desk unit is to be in the control room, incorporating the main circuit breaker control switch and indicating lamps.

A recent development which has already aroused interest in shipping circles in many countries is the production of two special types of portable motor for "Seco" lifeboat winches supplied by Welin Maclachlan Davits, Ltd., London and Glasgow. They are claimed to possess numerous advantages over the American units (portable drilling machines adapted for use with winches) which they were designed to replace. They are totally enclosed and weatherproof, and considerably lighter than the American screen-protected design.

"Birmabright," which does not flake in sea atmosphere, has been used for the end brackets and cover, the frame itself being of fabricated steel. Complete with cable the 4 h.p. 6,500 r.p.m. unit weighs 100 lb and the 6 h.p. 6,000 r.p.m. type 115 lb. A push-button solenoid operated control, incorporated in the end of the tubular bar used to carry the 4 h.p. unit, gives direct-on-line switching, while on the 6 h.p. size the starting is hand-operated with a resistance incorporated to counteract the surge.

The motor, available for either 110 or 220 V d.c., is compound wound with interpoles. It is built to a strict marine specification and "Lewmex" and double cotton coated wire are used in the armature. The finished machine is double sprayed with non-track varnish. The units are rated for three lifts of a lifeboat, allowing three minutes a lift. In the 4 h.p. model a thermostat on the frame is set to trip the operating coil of the push-button when the temperature reaches a predetermined value. The starting current is four or five times the full load current.



Synchronous motor generator set for Australia comprising a 2,580 h.p. 10,250 V motor coupled on each side to a d.c. generator capable of producing 8,000 A at any voltage from 4 to 110 V

The company has manufactured switch and control gear from the early days as part of the equipment of its rotating machines. The present-day range in course of manufacture includes hand-operated control gear up to 3,000 A stator current and contactor gear from small direct-on starters up to multi-motor control schemes with contactor gear to 1,000 A d.c. and 600 A a.c. capacity.

In the switchgear section various types of industrial switchgear were in course of construction up to 800 A 250 MVA 11 kV capacity, a typical unit being a distribution switchboard for the North Eastern Division of the National Coal Board. In this a 1,000 A 550 V 800 kVA draw-out truck type incoming transformer panel is combined with draw-out pattern circuit breaker units for various feeders with cable earthing devices and switch and fuse circuits for the lighting distribution.

In the Rectifier Department heavy current plating rectifiers were in course of construction similar to the 10,000 A plating equipment installed at the Bristol Aeroplane Co.'s works. The company has recently provided two 60,000 A plating rectifier equipments for the electro-tinning lines at the Trostre works of the Steel Company of Wales. This equipment included 16 V rectifier units in multiple, water-cooled transformers, main and trimming induction regulators, and automatic control switchgear.

A range of mercury-arc rectifier units was seen in course of manufacture, the unit valve sizes being from 10 to 500 A, built in multiples to any required capacity. The mercury-arc rectifiers are also incorporated in the company's "Varispeed" drive; examples seen included many for the textile industry as well as for wire-drawing machines, bar and tube draw-benches, etc.

In the Transformer Department further orders comprising four 2,000 kVA and 1,500 kVA 23 kV/6,900–11,950 V/2,300–3,985 V units were in hand for Nova Scotia. Thirty 300 kVA and eight 450 kVA transformers have recently been packed for shipment to New Zealand.

Sixty-four oil immersed outdoor type transformers are in hand for the Government of Ceylon, to the instructions of the Crown Agents for the Colonies. These are for 10,750/416 V and of the following ratings:—500 kVA (10), 300 kVA (24), 75 kVA (24) and 25 kVA (6). Typical of the company's range of transformers (up to 10,000 kVA and to 33 kV) are the units illustrated:—2,000 kVA 33 kV/11·9 kV/3·4 kV 3-phase outdoor type transformers for the Oakdale substation, Capetown, South Africa; and three 100 kVA 11 kV/440 V outdoor type transformers at the School of Mines, Kalgoorlie, Western Australia.

To provide the steam needs for process work (ovens, impregnators, etc.) in the extended factory and also for heating the works and offices, the boiler house plant has recently been modified to include three new 20,000 lb/hr oil-fired boilers together with a new cooling tower as well as modifications to the existing tower.

The boiler plant also supplies two Belliss & Morcom steam engine generating sets, these being run for a month alternately. Each set drives an alternator and also a d.c. generator, these E.C.C. machines combining with others to provide about a third of the a.c. and d.c. supply requirements of the factory.

In this boiler house reconstruction the fan, pump and other auxiliary motors, together with the distribution and automatic control gear, have been provided from the various departments of the works.

BRAZILIAN NOTES

From Our Rio de Janeiro Correspondent

THE Brazilian law regulating exchange transactions became effective on 21st February. A list of the raw materials and manufactured goods, industrial equipment and machinery, which may be imported at the official rate (52·41 cruzeiros to the £1), was published in the *Diario Oficial* of 28th February. Merchandise not considered strictly necessary to national economy must be paid for at the "free" rate.

Among the items of interest to the electrical industry which may be imported at the official rate are: Iron and steel and alloys thereof; unprepared copper and copper in bars, ingots, etc.; aluminium and alloys; tin, zinc, lead, chromium and tungsten; receiving and transmitting sets for radio telegraphy and telephony; radio equipment for aerial navigation; radar apparatus; telegraph and telephone apparatus and accessories; valves and tubes; electro-medical and X-ray apparatus; electric lighting and signalling equipment for motor vehicles, aircraft and ships, exclusive of automobiles; ditto for control and signalling on roads and railways; electric cables and wires; electric generators and similar machines, coupled to steam, hydraulic or internal combustion engines or windmills; windmills; steam and hydraulic turbines; diesels, semi-diesels and spare parts; farm and industrial machinery and equipment; electric trains and accessories; aircraft accessories; carbons for electrodes, etc.; scientific apparatus and instruments; and apparatus for medical, dental, surgical, optical and veterinary work.

Export bills will be negotiated at the official rate, but fixed proportions, ranging from 15 to 50 per cent, may be negotiated at the free rate in the case of certain high-priced products which cannot compete in international markets at the official rate. Practically all the products in question (essential and industrial oils, fibres, cotton linters, fruits, nuts, skins and leathers, timber, etc.) are marketable in Great Britain, so that it may now be possible to increase to some extent British purchases in Brazil and improve the sterling position.

On 21st February the Bank of Brazil began buying and selling foreign exchange on the basis of 38·00 and 39·50 cruzeiros to the American dollar (official rate 18·72) and has continued to maintain the same rates. By 11th March, however, private banks were operating at 42·00 and 43·00, while sterling, which had been selling at 105 cruzeiros for some days, had risen to 109. This rate is expected to improve when the negotiations to liquidate the sterling arrears are completed.

New Sao Paulo Power Station

President Vargas has approved a project, recommended by the Brazil-United States Commission, for a thermal power station to be built by the Sao Paulo Light & Power Co. at Piratininga. Application has been made to the International Bank for Reconstruction and Development for a loan of U.S. $18,790,000 to finance imports of equipment. Expenditure in Brazilian currency is estimated at the equivalent of £6,333,460. The new station will enable the company to increase installed capacity by 160 MW. It will be equipped with two 80 MW, 1,800 r.p.m. turbo-generators with turbines operating at a pressure of 60 kg/sq cm (853 lb/sq in) at 496 deg C. The three-phase hydrogen-cooled generators will have a nominal rating of 100 MVA at 13·8 kV, 60 c/s, 0·8 p.f.

Steam will be supplied by two boilers, with a maximum continuous rating of 850,000 lb/hr. The equipment will be supplied and installed by Stone & Webster, U.S.A., and the station is expected to begin operating within two years.

The Brazil-United States Commission recommended the project as an emergency measure to relieve the shortage of electricity in Sao Paulo. It expressed the opinion that, in general, an increase in thermal power stations is not justified in Brazil unless production of oil or coal develops sufficiently to avoid the need for increasing imports.

Large Coal-Handling Plant

Arrangements at Castle Donington

ONE of the largest coal-handling installations in this country is in process of construction at Castle Donington power station by Babcock & Wilcox, Ltd. It will have a total handling capacity of 960 tons/hr to the boiler house bunkers, and a storage capacity in the coal store of more than 500,000 tons.

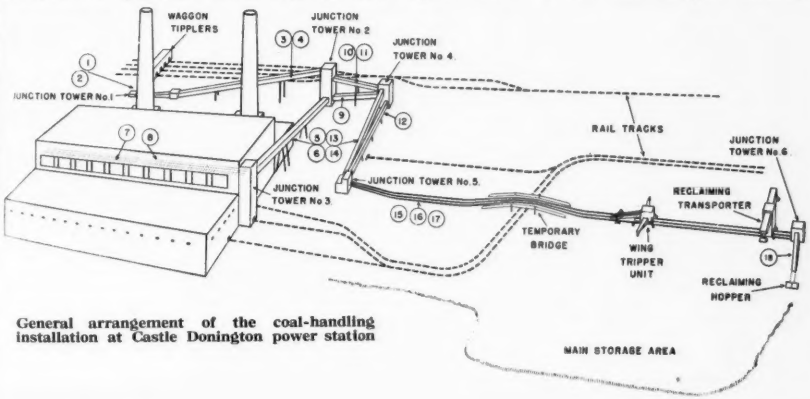
Rail-borne coal arrives at the tippler house which, at present, is being built to span four tracks, the initial installation comprising three B. & W. side discharging wagon tipplers, with Avery automatic weighers. The tipplers will handle wagons up to 35 tons gross weight, at a rate of 15 wagons an hour. Each tippler is fitted with dust extraction and collecting plant, the equipment being in the upper part of the tippler house.

From the tippler hoppers the coal passes, via " Sherwen " electric vibrating feeders and bifurcated chutes, to belt conveyors Nos. 1 and 2 (see illustration) which transport it underneath the rail tracks and deliver it over-end at No. 1 junction tower to two conveyors Nos. 3 and 4, running at right angles to the previous direction. These conveyors use the Babcock-Taylor twin motor tandem drive recently developed for long conveyors, and the coal is carried some 450ft and delivered to junction tower No. 2, about 90ft above ground level. The heads of conveyors 3 and 4 are fitted with magnetic pulleys as well as overband magnetic separators.

Junction tower No. 2 contains, with other equipment, the screening and crushing plant, and also the sampling equipment, and forms the key point of the conveyor system. From here coal may be despatched direct to the bunkers or diverted to the coal store; the bunkers may be fed either direct from the wagon tipplers, or from the store, or from both simultaneously.

Coal from the tipplers passes through " Tyrock " screens and, if oversize, through crushers to the transfer hopper. From there coal may leave by two conveyors, 5 and 6, en route for the boiler house bunkers, or it may be diverted to store by conveyor 9. Reclaimed coal from the store is delivered by conveyors 10 and 11, entering near the top of the tower and discharging to the common transfer hopper. The heads of the latter conveyors are also fitted with magnetic pulleys and overband magnetic separators.

At the heads of the four incoming conveyors 3 and 4 and 10 and 11, " Geco " primary samplers are arranged. The primary samples proceed by chute to a crusher where they are reduced to pass a ⅛in mesh. Under the sampler crusher



General arrangement of the coal-handling installation at Castle Donington power station

there is a secondary sampler, and the final sample is taken down into a collecting box on the sampler house floor. The reject material is returned to the transfer hopper.

Conveyors 5 and 6, which take the coal from the transfer hopper, are each fitted with a separated tandem drive and transport the coal to No. 3 junction tower forming an extension to the bunker bay, a distance of about 420ft, and deliver over-end at about 125ft above ground level on to conveyors 7 and 8 which run over the bunkers the entire length of the boiler house. These are about 514ft between centres and are fitted with automatic travelling trippers arranged for discharging coal into any of the six bunker pockets.

From No. 2 junction tower to the remote end of the coal store, there are three paths, one for stocking-out and two for reclaiming. The stocking-out conveyor 9 and the two reclaiming conveyors 10 and 11 run from No. 2 to No. 4 tower (about 155ft) where the direction changes through a right angle, conveyor 9 delivering to conveyor 12, and Nos. 10 and 11 being fed from Nos. 13 and 14. A further right angle bend occurs at No. 5 junction tower 365ft away, where No. 12 connects with No. 16 storing-out conveyor and Nos. 13 and 14 connect with 15 and 17 reclaiming conveyors. Conveyors 15, 16 and 17 are the longest in the system, the run between junction towers 5 and 6 being 2,060ft between centres. They run in the open, with wind guards on the outer sides. Near the centre there is a temporary bridge structure to enable them to clear the rail tracks which are being used for construction work on the station.

Because of the unusual length of the conveyors, special consideration had to be given to both temporary and permanent adjustment of belt slack, and to the maximum permissible belt stress when starting. The arrangement* has a main drive of 130 h.p. at the delivery end of each conveyor, pulling on the loaded belt, and a 60 h.p. auxiliary drive at the other end, which pulls on the return side of the belt. By this means, the temporary slack in front of the main drive is taken up by the auxiliary drive at the earliest possible moment, and the maximum belt tension at starting is considerably reduced. To compensate for the temporary stretch of the belts, gravity type take-up pulleys are arranged at either end of the belt. Any permanent stretch which may occur after running in and during the normal life of the belt, is dealt with by screw-type take-ups, which are also provided at each end.

*Patent No. 626579 : R. A. Taylor, Babcock & Wilcox, Ltd.

Storing-out from conveyor 16 is by means of a special wing tripper, which travels along the conveyor on rail tracks, and distributes the coal by wing conveyors with spans of 44ft either side of the main conveyor. The planned storage height is 15ft, which will give an estimated capacity of 536,000 tons. Distribution over the area will be by bulldozers and carry-alls. For reclaiming purposes there is a 14 ton electric travelling grabbing transporter with a span of 110ft which travels on the same tracks as the wing tripper and is fitted with a grab of 6·5 tons capacity, delivering through a hopper with split chutes and vibrating feeders to conveyors 15 and 17. Another method of reclaiming is by bulldozing the coal into a ground hopper, which is 170ft away from the end of the main conveyors, and feeds these by a single conveyor, No. 18, which connects with conveyors 15 and 17 at junction tower No. 6.

Coal Weighing

As previously mentioned, incorporated with the tipplers are Avery weighing machines, so that all incoming coal can be weighed, and these record the weight of coal entering the station, whether it goes directly to the boiler house or to store. A Blake Denison automatic belt weigher is provided on conveyor 9, which takes a feed from the transfer hopper in No. 2 tower en route to the coal store, and also on conveyors 10 and 11 on the return route from the coal store, before the coal enters the transfer hopper on its way to the boiler house. In this way coal going out to store and coming back from store is all recorded.

The entire conveyor system is fitted with Babcock cartridge type oil filled ball bearing troughing and return idlers, thus eliminating greasing operations which would be no small matter on a system which has well over four miles of belting. The total capacity of the motors associated with the conveyor drives is something over 1,500 h.p. and all of them are fitted with hydraulic couplings. This does not include motors associated with the wing tripper, the reclaiming transporter or the various drives for crushers, screens and other auxiliaries.

Guards for Heaters

New Regulations Issued

By C. F. MAYSON, A.M.I.E.E.

THE Heating Appliances (Fireguards) Act, 1952,* designed " to prohibit the sale or letting of certain heating appliances without an effective fireguard," which received the Royal Assent on 1st August last year, applies to England, Wales and Scotland, but not to Northern Ireland. It stipulates that the Home Secretary shall make regulations for the implementation of the provisions of the Act and these have now been published.†

As from 1st October this year it will be an offence to sell or to let on hire or hire-purchase " in the course of a business," any electric or gas fires, or oil heaters so designed as to be suitable for use in residential premises unless they are guarded in the prescribed manner. Local authorities (defined in Section 7 of the Act) are empowered (Section 2) to inspect and test appliances on any premises where they are kept for the purpose of sale or letting. Wilful obstruction of any duly authorized inspector will be an offence.

Anyone guilty of an offence is liable to a fine of up to £50 (Section 3). Where an offence is committed by a firm, company or other corporate body, a director, manager, secretary or other officer found to have been responsible will himself be liable. Local authorities in England and Wales may institute proceedings (Section 4).

Appliances Excluded

Circumstances in which the operation of the Act is excluded are set out in Section 1. These are not very clearly defined, but it would seem that the effect is to place outside the Act appliances sold for use outside Great Britain, those already on hire or hire-purchase before the appointed day, and those let on hire incidentally to the letting of premises. Hire-purchase finance firms, who are never in possession of an appliance and acquire the property only when entering into an agreement, are not liable. It would also appear that a trader (or auctioneer?) who sells an appliance " as the agent of a person who is not acting in the course of a business," will not be liable either. This last exception is probably limited in practice to the sale of second-hand appliances on commission only, for if a trader acquires the property in an appliance he will almost certainly bring himself within the Act.

The new regulations provide, inter alia, that appliances sold for scrap need not be fitted with guards. Appliances, other than imported appliances, manufactured before the date of the coming into operation of the regulations may be sold or let on hire or hire-purchase at any time before 1st October.

Design Requirements

Methods of constructing and fitting guards are given in a schedule to the regulations. It is provided that when the conical portion of a test probe of the dimensions set out in Fig. 2 in B.S. 1945 : 1953 (Fireguards for Heating Appliances)‡ is used on an electric fire to which a guard is fitted, it shall not be possible, without applying undue pressure, to insert the probe through or round the guard so as to touch the heating element or terminals.

When the appliance has been on circuit for not less than 30 min or more than 60 min a piece of dry flannelette (as specified in B.S. 1945) shall not smoulder or ignite within 10 sec when placed on the middle of the guard from top to bottom.

These tests are to be applied after the guard has been tested for strength by means of a 5lb weight applied to its centre while in a horizontal position.

* H.M. Stationery Office, price 3d.

† S.I. 1953 No. 526, The Heating Appliances (Fireguards) Regulations, 1953, price 3d; and S.I. 1953 No. 524 (s. 46), The Heating Appliances (Fireguards) (Scotland) Regulations, 1953, price 3d.

‡ British Standards Institution, 24, Victoria Street, London, S.W.1, price 2s.

COMMERCE and INDUSTRY

Singapore Submarine Cable Factory

Electronic Computer Contract

CABLE & WIRELESS, LTD., announces that its new £232,000 submarine cable factory and depot at Singapore is beginning production this month. The factory is at Bukit Chermin and will replace the company's old factory in Singapore which was opened in 1887. It will be capable of manufacturing between 800 and 900 nautical miles of submarine cable of all types annually, for the maintenance and development of the 20,000 mile sections in the Far East of the company's 155,000 miles of Commonwealth cable system.

There are six buildings including a main office block comprising an electrical workshop, a small-parts storeroom, and a cable testing room; main steel factory; main workshop; storerooms; and storage tank rooms. Fifteen cable storage tanks will be available. The manager is Mr. C. Campbell.

Ferranti Computer for Holland

Ferranti, Ltd., have received an order from the Royal Dutch/Shell Group to provide an electronic digital computer for use in their large research establishment in Amsterdam. The machine will be housed in a new laboratory now under construction. Including installation and ancillary equipment the value of the order is approximately £100,000. The computer is a development of the one installed in the University of Manchester in 1950 and of that sent last year to the University of Toronto and it incorporates a number of improvements in design. It will be the first electronic digital computer that Ferranti, Ltd., have been called upon to make for purposes other than academic or governmental use and the first large machine to be supplied by them to a commercial undertaking. This type of apparatus, number six of a series designated the "Manchester Universal Electronic Digital Computer," will be used for the extensive calculations required in research in petroleum chemistry and engineering. Delivery will be made early in 1954.

Proposed Newcastle Electrical Club

Mr. A. C. Bendall, of the Newcastle-on-Tyne office of the Simplex Electric Co., Ltd. (Kent House, Church Street, Newcastle), tells us that he and Mr. W. J. Johnson, of J. A. Crabtree & Co. (31, Holmwood Avenue, West Monkseaton, Whitley Bay), are approaching about 200 people in the Newcastle area to ascertain what support there is for the idea of an Electrical Club for Newcastle similar to that in Birmingham. A meeting to discuss the subject is being held at 7 p.m. next Thursday (16th April) at the Turk's Head Hotel, Grey Street, Newcastle, and Messrs. Bendall and Johnson would be glad to hear from any who are willing to attend.

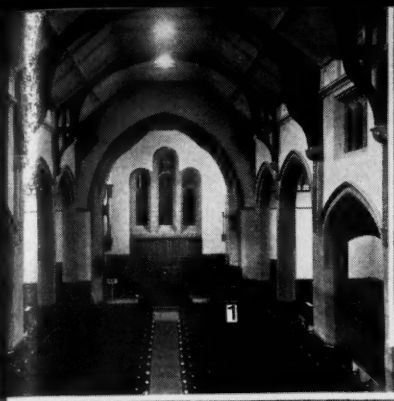
Aircraft Food Heater

The service of hot meals is difficult in modern jet bombers because crew members have not the same freedom of movement as in the older piston engine types. The G.E.C. has overcome this by producing for each crew member an individual ration heater which is fixed to any convenient bulkhead adjacent to the crew station. The heater comprises an outer and inner container of spun aluminium, the size of the inner container being 3·25in in diameter by 6in high. It holds nearly 1·5 pints and fits into the outer unit so that it is in close contact with the heating element, which is in turn insulated from the outer casing by glass fibre. The bulkhead space occupied is just over 8in by 5in.

The 28 V element is rated at 75 W and will heat the contents from an ambient temperature

EXAMPLES OF MODERN LIGHTING PRACTICE

(1) Built-in lighting units at St. Stephen's Church, Edinburgh. (Holophane, Ltd. Electrical contractors: Wm. Barton & Sons, Ltd.). (2) Fluorescent fittings in St. Andrew's Street Post Office, Dublin. (Thorn Electrical Industries, Ltd.). (3) Cold cathode lighting at the Rolls Royce factory, East Kilbride. (General Electric Co., Ltd. Electrical contractors: James Kilpatrick & Son, Ltd.). (4) Twin-lamp fluorescent fittings in the hull moulding shop of Halmatic, Ltd., Portsmouth. (British Thomson-Houston Co., Ltd.). (5) Indoor cricket school lighting, Romford. (Ekco-Ensign Electric, Ltd.). (6) Vapour-proof fluorescent fittings in the N.C.B. laboratory, Wardley Colliery, Co. Durham. (Crompton Parkinson, Ltd. Electrical contractors: F. Reid, Ferens & Co., Ltd.). (7) Subway lighting, London Airport. (Courtney, Pope (Electrical), Ltd.). (8) Four-lamp cold cathode fittings at the Letchworth factory of K. & L. Steelfounders & Engineers, Ltd. (Edison Swan Electric Co., Ltd. Electrical contractors: Eastern Electrical Co., Ltd.)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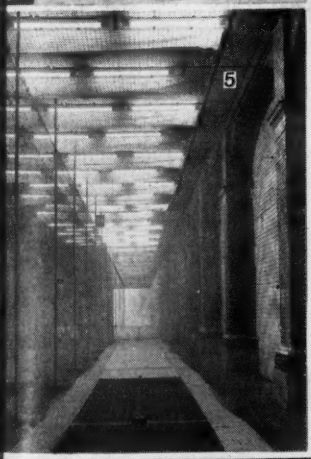
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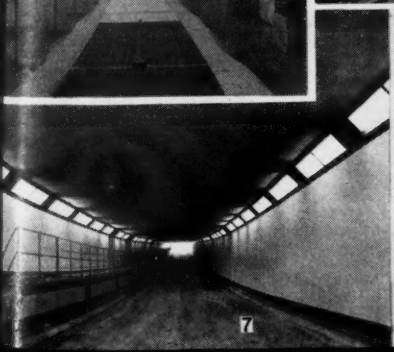
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of 58 deg F to a maximum of 202 deg F in less than two hours. Quantities of these heaters have been ordered for R.A.F. Bomber Command.

Electrical Machinery Trades Convention

The annual convention of the Association of Electrical Machinery Trades will be held at the Queen's Hotel, Eastbourne, from 19th to 21st April. Delegates will assemble on the afternoon of the first day and there will be a dinner in the evening. The Council meeting will be held on the second day and will be followed by a luncheon, after which a paper, " The Application and Uses of Fibreglass: particularly Electrical," will be read by Mr. A. R. Henning. A dinner and dance will be held in the evening. On the last day Mr. F. H. Schroeder will present a paper on " Appraisal and Application of Electrical Power Drives for Machine Tools," which will be followed by a luncheon.

Direct Reading Spectroscopy

The Industrial Spectroscopy Group of the Institute of Physics has formed a panel of members interested in direct reading equipment for spectrochemical analysis. These devices combine spectrographs with electronic equipment in such a way that the intensities of characteristic spectral lines give a direct reading of the percentage of the elements present in the specimen. The object of the panel is to organize meetings which will serve the interests of users and potential users of this equipment. The first meeting arranged by the panel took place in London recently when Dr. A. C. Menzies introduced the subject. Mr. A. L. Pendrey and Mr. R. T. Staples followed with accounts of their experiences in this type of work and a general discussion ensued.

Automatic Machine Showroom

At their Worcester factory Heenan & Froude, Ltd., have completed a permanent showroom for the display of automatic machines. This showroom, which has been built primarily for visitors to the United Kingdom, will have a full range of Heenan automatics installed in time to demonstrate their applications to overseas visitors who will be in this country for the British Industries Fair.

Uruguayan Import Quotas

On 27th March the Uruguayan authorities announced the opening of further quotas for the import of United Kingdom goods to a value of £1,410,000. These quotas are for goods classified by the Uruguayan authorities in the Second and Third Categories—that is, medium and less-essential goods. These include electrical goods, cookers, clocks, electrical domestic machinery, domestic refrigerators, and radio valves. The Board of Trade states that the Uruguayan authorities require applications for import licences to be submitted before 15th April.

Virgin Aluminium Price Reduced

The Ministry of Materials announces that from 1st April, 1953, the price of virgin aluminium in ingot form of a purity of 99 per cent to 99·5 per cent inclusive has been reduced from £166 to £161 per long ton delivered into consumers' works. There will be no change in the premiums which came into effect on 1st July, 1952, for metal of higher purity and for metal in notch bar form. The reduction in price has been made possible by the improved rate of exchange of the pound sterling in Canadian dollars.

Iron and Steel Directory

The seventh edition of the " Iron and Steel Directory " just published by the Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1 (350 pp.; price 25s, postage 8d) contains a completely revised list of British pig iron manufacturers and detailed lists of some 2,500 iron-founders, steel works, steel founders and makers arranged geographically; alphabetical lists are also included. Other lists include the names and addresses of iron and steel trade associations and iron, steel and engineering scientific and technical societies and institutions with the names of their secretaries. The book also contains a large amount of technical data for engineers, metallurgists and iron and steel makers and users. The final

New Worcester showroom of Heenan & Froude, Ltd.

section comprises a classified list of manufacturers engaged in the iron, steel and allied trades together with a list of their addresses. Some 385 products are listed, ranging from abrasive wheels to X-ray films.

Fatality

A verdict of accidental death was returned at an inquest held in Belfast on 24th March on Joseph Alexander Begley, B.Sc., A.M.I.E.E., who received a fatal electric shock while carrying out an experiment in connection with soil heating at the Belfast Corporation power station at East Bridge. It was stated that the deceased accidentally touched a high voltage connection. Mr. J. A. Young, deputy town solicitor, said that the experiment was of the sort which was neither authorized nor forbidden by the Electricity Department. Mr. Begley's position was one in which he could use his initiative and carry out such an experiment. Mr. S. Cassells, a Ministry of Labour factory inspector, paid tribute to the speed with which artificial respiration had been applied.

A display of television sets arranged by Leonard's Electrical (Chippenham), Ltd.

European Coal Production

An estimate of the coal position in Western Europe in 1952 and 1953 has been published by the Organization for European Economic Co-operation as document C (52) 225, which is supplementary to a report of May, 1952. During the first six months of last year the coal mined, 431 million tons, by the six main producing countries exceeded the amount for the corresponding period by 2 per cent instead of the 3·4 per cent envisaged in the earlier report as necessary to meet normal industrial expansion and to avoid exceptional imports of American coal. The present report (103 pages) reviews, for the same six countries, the problems of production, outputs per man-year, incentives (including tax remission), stock building and utilization trends. Supporting data and statistics are given in appendices.

Chippenham Television Demonstration

From 12th to 14th March Leonard's Electrical (Chippenham), Ltd., arranged a television demonstration at the Angel Hotel, Chippenham, when television pictures were shown during the normal transmitting periods from three o'clock onwards.

Twenty-three receivers made by well-known manufacturers were arranged to run off one aerial. The technical side of the feeding was arranged by putting a main one-valve pre-amplifier at the point of entry of the aerial to the building, followed by a three-way dividing box, through three more single-valve pre-amplifiers, the lines from these three pre-amplifiers being run to three different positions in the room, where eight-way dividing boxes were used to feed eight receivers from each; these dividing boxes, or matching units, were designed and made in the company's own workshop. The layout of the display is shown in the accompanying picture.

Electrical Engineers' Exhibition

In our report of the lunch at the Electrical Engineers' Exhibition last week the names of the speakers on behalf of the electrical manufacturers should have been given as Mr. E. Peacop, director of Walsall Conduits, Ltd., and Mr. W. J. Jones, director, Electric Lamp Manufacturers' Association.

Canadian Electrical Manufacture

The values of the production of the Canadian electrical apparatus and supplies industry, preliminary figures of which were given in the *Electrical Review* of 24th October last, have now been issued in detail. The table which follows (page 824) shows the selling value at works of the chief items produced in 1951.

Prominent in the relatively large and increased totals of wires and cables were uninsulated aluminium and a.c.s.r. conductors and aluminium alloys, valued at $13,547,000 compared with $10,428,000 in 1950; paper insulated telephone cable, $12,783,000 ($9,660,000); and weatherproof wires $11,216,000 ($7,079,000). Of the motors made nearly one-third in value consisted of single-phase induction machines of ½ h.p. and under, the next being 1 to 5 h.p.

Class of Manufacture	1951 $ (000)	Inc. or dec. on 1950 $ (000)
Generators and parts	16,780	+ 4,436
Convertor equipment	4,132	+ 1,234
Lamps, standard sizes	9,716	− 1,142
Lamps, miniature	2,461	− 51
Lamps, fluorescent	3,252	− 859
Lighting fixtures	21,565	+ 2,236
Washing machines, electric	21,565	− 5,595
Furnaces	356	− 9
Industrial ovens, etc.	1,812	+ 237
Watt-hour meters	7,211	+ 543
Wires and cables	123,769	+ 32,910
Motors and parts	41,825	+ 6,380
Industrial control equipment	11,034	+ 3,216
Radio receiving sets (civilian)	29,635	− 3,863
Radio valves	6,283	+ 412
Television sets	12,902	+ 5,137
Refrigeration equipment	63,907	− 5,014
Transformers and parts	48,161	+ 9,376
Telephone material	40,255	+ 10,535
Vacuum cleaners and parts	8,902	+ 361
Stoves over 35 A	21,105	− 2,386
Rangettes	1,389	− 288
Grills, etc.	194	− 162
Electric flat irons	2,646	− 76
Electric toasters	1,540	− 287
Water heaters	1,481	− 177
Switchgear and protective equipment	35,626	+ 5,839
Wiring devices	15,629	+ 824
Welding apparatus	3,748	+ 841
Batteries, storage	20,200	+ 3,095
Batteries, dry cell	8,903	+ 156
Apparatus and parts not elsewhere specified	45,486	+ 10,730

polyphase induction motors valued at nearly $5 million. The 30 per cent increase in generators was accounted for largely by a.c. machines of 1,001 kVA and above, numbering 34, of a total value of $14,798,000, against 28, valued at $10,999,000, in 1950. A new item was electric blankets valued at $252,000.

Marine Engineers' Activities

Two more Home Sections of the Institute of Marine Engineers have been formed, namely the North East Coast Section, with Mr. H. White as chairman, and the Clydeside and Southern Scotland Section (chairman, Mr. T. A. Crowe). Information about their activities is obtainable from the local honorary secretaries at the following addresses: Mr. A. W. Jones, Mechanical and Marine Engineering Department, University of Durham, King's College, Newcastle-on-Tyne, 1, and Mr. J. D. B. Mundie, Stow College School of Engineering, 43, Shamrock Street, Glasgow, C.4.

Trade Announcements

The Leeds office of **International Combustion, Ltd.**, and of the **Riley Stoker Co., Ltd.**, has been moved to new premises at National Employers' House, Quebec Street, Leeds, 1. The telephone number will remain as before, Leeds 33274.

Dexion, Ltd., has opened new offices at 20, Renfrew Street, Glasgow. New offices were opened at Liverpool recently.

A new area office has been opened by **Fisher & Ludlow, Ltd.**, at Clifton Lodge, Park Crescent, Victoria Park, Manchester, 14 (telephone: Rusholme 6307), in order to extend to the north the services and facilities of their material handling division. The office is under the management of Mr. R. H. Taylor.

We have received from **Uppington & Son,** St. James' Parade, Horsefair, Bristol, sales representatives for a number of concerns, including Agro Electrical, Ltd., Electric Art Shades, Ltd., and Etcher & Wells, Ltd., a number of fibre table mats cut into the shape of a gear wheel, which we shall find useful when taking the afternoon cup of tea. Small supplies are available to any West of England dealer.

Catalogues and Lists

New Day Electrical Accessories, Ltd., 136-138, Mary Street, Balsall Heath, Birmingham, 12.—Leaflet announcing price reductions for neon pilot control switches.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—52-page illustrated catalogue of "Osram" photographic and projector lamps and photoflash bulbs (OS/1884)

Hanovia, Ltd., Slough, Bucks.—Leaflet describing the "Hanovia" mercury vapour detector.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—Illustrated technical catalogue on self contained alarm systems (D/RC24).

Simplex Electric, Ltd., Broadwell, Oldbury, Birmingham.—Price list of "Lundberg" electrical accessories (LA.1975).

Wholesale Fittings Co., Ltd., 46, Commercial Street, London, E.1.—92-page illustrated priced catalogue of domestic electrical appliances (455).

G.W.B. Electric Furnaces, Ltd., Dibdale Works, Dudley, Worcs.—Illustrated catalogue dealing with "Autolec" electrode water heaters (WH.352/A).

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Cobo" conduit boxes.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Prospects in India

Power Supply and Electrical Manufacture

A COMPREHENSIVE report (dated September, 1952) covering over 400 pages has been prepared by Mr. R. Owen, Senior United Kingdom Trade Commissioner in India, on the economic and commercial conditions in India, and published by H.M. Stationery Office at 11s net. In it Mr. Owen gives a detailed review of the development and prospects of both the supply and manufacturing sides of the electrical industry.

Dealing with the electricity supply industry, he says that the estimated capacity of generating plant in 1951 was 1,835,184 kW, of which 1,109,934 kW was steam operated, 158,265 kW diesel and 566,985 kW hydro-electric. Plant installed per 1,000 population at 1st January, 1951, was 4,733 kW, and plant installed per square mile 1·402 kW. The total generated in 1950 was 5,106·7 million kWh, of which 2,387·2 million was steam generated, 199·7 million diesel and 2,519·8 million hydro-electric.

Most of the electrical development in India has so far been limited to satisfying the demand of urban areas for power for industrial purposes. Over 60 per cent of the electrical energy produced by public electricity supply undertakings throughout India is absorbed in the cities of Bombay, Calcutta, Madras, Ahmedabad, Cawnpore and Delhi which contain less than 3 per cent of the population of the whole country. Out of 560,000 villages with a population of 5,000 and below not more than 0·5 per cent had been electrified by the end of 1950.

Scope for Development

There is thus enormous scope for the extension of electrification in India and Mr. Owen points out that though in the rural areas this might be uneconomical, considered from the point of view of return on capital invested, it could do much to advance rural development by providing power for tube well irrigation, the processing of agricultural products and the establishment of cottage industries to give employment to large numbers of landless labourers.

Plans for the progressive development of the water and power resources of the country have been drawn up covering five, ten and fifteen year periods. According to the "draft-outline" of the first five-year plan, 451 crores of rupees is to be set aside for bringing 8·7 million acres of land under irrigation and for developing 1·1 million kW of additional power, which will increase the irrigated area of the country by 20 per cent and the power potential by 65 per cent over and above the 1950 capacity.

A complete plan for the development of irrigation and power in India provides that over a period of fifteen years further projects will be taken up which, together with the irrigation and power schemes already under construction, will increase production of power by 7 million kW and bring an additional area of 42 million acres under irrigation and provide additional food supplies of the order of 14 million tons. Mr. Owen outlines the river development projects included in the five-year plan.

Electrical Manufacturing Industry

Turning to the manufacturing side of the industry, Mr. Owen says that while there is in India no electrical engineering industry in the sense conveyed by the use of these words in the United Kingdom, there is a considerable and extending business in the manufacture of specific and mainly end-products over a limited range of individual types of plant and electrical stores. There is every sign that a more widely based industry will progressively be established in the future as technical skill and training of Indian personnel proceeds.

Electrical equipment and apparatus produced in 1951 included electric motors up to 150 h.p. (149,500 h.p.), transformers up to 33 kV (171,300 kVA), dry batteries and accumulators (143·4 million cells), electric lamps (15·1 million), fans (212,400), and electric wires and cables (3,300 tons). Production in India of house meters and refrigerators commenced during 1951.

CLASS	1951-52	1950-51	Leading sources of Imports
	Lakhs of rupees		
Control and switchgear (all types)	417·31	364·40	United Kingdom, United States
Generators, alternators and dynamos	237·93	155·39	
Motors	111·74	127·53	
Transformers	144·55	150·55	
Turbo-generator sets	152·39	64·50	
Batteries and accumulators	63·05	41·05	
Fans	5·51	3·23	United Kingdom, Italy, Japan, Singapore
Meters	107·42	64·17	United Kingdom, Switzerland
Domestic refrigerators	65·30	25·88	United Kingdom, United States, Sweden
Refrigerating equipment	77·98	81·78	United Kingdom, United States
Electro-medical and X-ray equipment	36·29	34·12	
Rubber insulated wires and cables	51·96	123·84	
Wires and cables (other insulations)	250·40	196·63	
Telegraph and telephone wires and cables	3·46	80·54	United Kingdom, Japan
Bare copper wire	3·51	2·12	United Kingdom
	Thousands		
Lamps (general service lighting)	583	536	United Kingdom, United States
Automobile lamps	9,928	823	Hong Kong
Torch lamps	21,053	15,850	United States
Lamps (other sorts)	589	1,831	United Kingdom, Hong Kong, United States

Little, if any, electrical generating equipment or heavy switchgear is at present made in India. The large-scale development of hydro-electric power at present being carried out and envisaged has created extensive demands for these classes of equipment and imports are likely to continue at a high level for a considerable time. The manufacture of industrial control and switchgear has been commenced in Bombay and Mysore, and there are two projects for setting up factories to make this equipment in Calcutta and Baroda.

The greater part of the electrical imports of India have always come from the United Kingdom and in the accompanying table we show the principal imports for the years 1950–51 and 1951–52, with the leading sources of supply. (Note: One crore of rupees = £750,000; one lakh = £7,500.)

MADRAS POWER PLANS

IN Madras the addition of nearly 200,000 kW of generating plant is contemplated under the first part of the five-year plan approved by the Government of India. Even with this, however, the available power will not keep pace with the rapidly growing demand and a supplemental plan envisages further construction costing Rs 9·47 crores (£7·8 million) in the period 1951–56.

Three additional developments are proposed, namely, the Periyar, Kundah and Krishna–Pennar hydro-electric schemes. The first-named provides for the utilization of the waters from the existing Periyar irrigation scheme on the Madras–Travancore border to operate three 25,000 kW sets with a fourth later. An initial capacity of 75,000 kW is also proposed by harnessing the waters of the Kundah and Upper Bhavani basins in the Nilgiris, the ultimate capacity being 175,000 kW. Power development at the Krishna and Pennar Dams is expected to produce 96,000 kW initially and 192,000 kW ultimately, to serve the needs of the Rayalaseema districts, Krishna, Guntur, Nellore and Madras City.

A record sum of Rs 8·07 crores (£6 million) was spent by the Madras Government Electricity Department on capital works in 1951–52. The Department's twenty-fifth annual report records that the total quantity of electricity generated in the State and purchased from other sources increased by 17·5 per cent to 806·15 million kWh and the system demand rose from 147,500 to 166,275 kW. New consumers numbered 53,908 (making 339,605), priority again being given to agricultural development in order to relieve the food shortage in the State. Electricity was extended to 282 more villages and to 3,265 irrigation pump-sets, but the rate of connection of the latter was affected by the shortage of line materials.

Because of the failure of the monsoon in the areas of the hydro-electric systems—for the fourth successive year—restrictions had to be imposed on power consumption.

The aggregate length of the Department's transmission and distribution systems was increased by 2,158 route miles during the year making the total 11,268 miles (including 5,983 miles of high voltage lines). Among major schemes completed were a 110 kV line from Erode to Salem (38·6 miles) and 66 kV lines from Tiruchirappalli to Dalmianagar (27 miles) and from Tanjore to Mayuram (44·7 miles).

ELECTRICITY SUPPLY

Month's B.E.A. Contracts Total £13·7 Million

Further Smokeless Zones Planned

CONTRACTS have been placed by the British Electricity Authority during the past month for power stations, transforming stations and transmission lines totalling £13,706,473. They include the following:—

Marchwood power station, near Southampton: Condensing and feed heating plant for one 60 MW turbo-generator set.—Hick, Hargreaves & Co. Circulating water pumps.—Drysdale & Co.

Portsmouth power station: High pressure pipework.—C. A. Parsons & Co.

Portishead power station, near Bristol: Foundations for buildings, roads, railways, drainage and ancillary works.—Chas. Brand & Sons. Coal handling plant.—Strachan & Henshaw.

Castle Donington power station, near Derby: Coal handling plant.—Babcock & Wilcox.

Drakelow power station, Burton-on-Trent: High pressure steam and feed pipework.—Aiton & Co.

Spondon power station, near Derby: Alterations to circulating water system.—Holloway Bros.

Hams Hall "C" power station, near Birmingham: Main civil engineering work.—Sir Robert McAlpine & Sons (Midlands). Structural steelwork.—Braithwaite & Co., Engineers. Coal handling plant.—Mitchell Engineering.

Meaford power station, Stone, Staffs: High pressure piping equipment.—Babcock & Wilcox.

Haverfordwest power station: Two 1,220 kW diesel alternator sets.—Crossley Bros.

Uskmouth power station, Newport: Roads, paths, drains, fencing, bridge over sidings and sundry work.—John Morgan (Builders).

Bold power station, St. Helens: Two 300,000 lb/hr boilers.—Yarrow & Co. 33 kV and lower voltage cable and accessories.—British Insulated Callender's Cables.

Keadby power station, Scunthorpe: 132 kV 2,500 MVA switchgear.—A. Reyrolle & Co.

Huddersfield power station: Structural steelwork for boiler house.—Heenan, Beddow & Sturmey.

Wakefield power station, Yorks: Main structural steelwork.—Dorman, Long & Co. Three 550,000 lb hr boilers.—Foster Wheeler. Two generator transformers.—English Electric Co. Coal handling plant.—Robert Dempster & Sons.

Stella North power station, near Newcastle-upon-Tyne: Two brick chimneys.—D. Theaker & Co.

Carrington power station, near Manchester: Second section of main foundations.—M. J. Gleeson (Contractors).

Chadderton power station, Oldham: Four 360,000 lb/hr boilers.—Simon-Carves. Foundation piles.—Franki Compressor Pile Co.

Fleetwood power station: Two cooling towers and circulating water culverts.—Fred Mitchell & Son.

Iver substation, Bucks: 7,500 MVA 275 kV switchgear.—A. Reyrolle & Co.

Tilbury substation: Site works.—Holloway Bros. (London)).

Kirkby substation, Lancs: 132 kV overhead line.—Riley & Neate.

Carrington substation, near Manchester: 132 kV overhead line.—Riley & Neate.

Castle Donington–Nottingham/Coventry: 132 kV overhead line.—Riley & Neate.

Pottery Makers' Protest

Protests against the increased electricity tariffs which came into operation on 1st April were made by a deputation from the British Pottery Manufacturers' Federation at a meeting of the Midlands Electricity Consultative Council at Walsall. Heading the deputation, Mr. J. F. Gimson, managing director of Worcester Royal Pottery, said that electricity was becoming too expensive to use industrially. The pottery industry could not put up its prices without jeopardizing its export trade, which was vital to the country's economy. "As an industry it is impossible to plan ahead or to put any capital into equipment when there is no stability and continual changing of tariffs," he declared. It seemed totally wrong that a vital export trade should be penalized for the sake of uniformity. The Council decided to put the deputation's case before the Midlands Electricity Board.

Proposed Scottish Smokeless Zones

The Scottish Fuel Efficiency Committee has suggested to the Government that smokeless zones should be established in a number of Scottish industrial cities and towns. This was announced by Sir Patrick Dollan, chairman of the Committee, in Glasgow on 27th March. In these areas all fuel consumers would be required to use only smokeless fuels, gas, or electricity. Sir Patrick said that the idea had already been adopted in Coventry and Manchester and in the latter city the scheme had worked so successfully that the smokeless zone was to be extended. The cities and towns in which the Committee had suggested that zones should be established were Aberdeen, Dundee, Edinburgh, Glasgow, Greenock, Paisley, Kirkcaldy, Motherwell, East Kilbride and Glenrothes. On the advantages and benefits of such areas, Sir Patrick said that during the recent heavy fog the Manchester smokeless zone

experienced a clear blue sky while the surrounding areas were blanketed in fog. It had been estimated by an expert that during the winter which had just ended fog caused by smoke cost the city of Glasgow £1,000,000 in loss of man-hours, damage and accidents, etc.

Consent to Overhead Line

The Minister of Fuel and Power has allowed the application by the British Electricity Authority for permission to erect an overhead line across land at Elford near Tamworth, to carry additional power to the Smethwick area from the new generating station near Burton-on-Trent. The application was the subject of a Ministry inquiry at Lichfield when objections were lodged by Mr. E. F. Wain, of Elford Park Farm, and other farmers. It was then contended that the line would depreciate the value of Mr. Wain's farm, and that electrical employees could enter the farm and damage arable land. The Minister states that the Authority will be liable to Mr. Wain for all damages including act of God arising out of the existence of the lines on his land. The Minister reserves the power to review his consent after May, 1957.

Manchester Transport Proposals

The general manager of Manchester's municipal transport system (Mr. A. F. Neal) has presented a report to the Corporation Transport Committee which visualizes the substitution of trolley-buses for motor buses on a number of the city's services. Comparisons of the two kinds of vehicles are made in the report to the advantage of the trolley-bus. It is contended that any decision upon the matter would have to stand for twenty years so that the overhead equipment and the necessary substations and cables would be paid for. At present Manchester is operating 193 trolley-buses and Mr. Neal is understood to have said that these cost £30,000 a year less to operate than an equivalent number of motor buses. It appears that the Committee's decision will depend largely upon the future level of the tax on oil fuels.

In the meantime the Committee is recommended to approve the purchase of 62 double-deck trolley-buses as replacements for existing vehicles.

Overhead Lines

Cumberland County Council has approved plans by the North Western Electricity Board for the construction of 11 kV lines at Tempest Towers, Little Orton, Corn Hill, Belle Vue, Hoskett Hill, East Curthwaite and Cumdivock.

Substation Plans

Easington R.D.C. has approved plans by the North Eastern Electricity Board for the erection of three substations at Easington Colliery in connection with plans for improving the district's electricity supply.

Street Lighting Schemes

HARTLEPOOL Town Council's estimates include £10,270 for proposed street lighting in West View Road, Hart Road, Cleveland Road, Throston Bridge, Milbank Crescent, Durham Street and Brougham Street, Hartlepool.

Informal approval has been given by the Ministry of Transport to a scheme for improved lighting at REDCAR. It is suggested that the complete conversion from gas to electric street lighting should be spread over ten years. As a first instalment of a scheme for the High Street it is proposed to borrow £746 for installing four fluorescent lamps, while sanction is being sought to a loan of £2,250 for mercury lighting from the town clock to the Lakes housing estate.

MIDDLESBROUGH Town Council's plans include street lighting on the Berwick Hills estate (£2,500), and Park End Estate (£4,000), additional lighting on privately developed roads (£1,000) and replacement of gas by electricity in existing streets (£5,000).

MORPETH Town Council has approved a report by the borough engineer for the provision of better street lighting at a cost of £8,837.

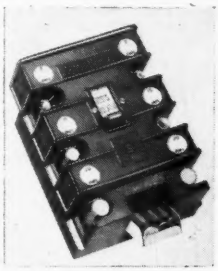
A dangerous bend in Colin Deep Lane, Hendon, lit by Osram 140 W sodium lamps in G.E.C. Z9444 cut-off lanterns. These lanterns, because they emit no light above the horizontal, do not confuse aircraft using the nearby Hendon aerodrome

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Consumers' Control Unit

A NEW approach to the design of consumers' control units has been made by WM. SANDERS & CO. (WEDNESBURY), LTD., Falcon Electrical Works, Wednesbury, in their E.G.613 all-insulated unit. Measuring only 4⅞in high by 4in wide by 2½in deep overall and weighing only 1¼ lb, it incorporates a 60 A micro-break switch with mechanical "on" and "off" indicator normally controlling two 5 A, two 15 A and two 30 A s.p. and n. circuits protected by cartridge fuses conforming to B.S. 1361. The arrangement of the circuits can be varied to meet requirements. The plastic moulded case incorporates a metal tray at the bottom carrying a spare set of fuses. Discs, coloured for the appropriate fuse ratings, are fixed on the front of the case and provide space for indicating the circuits protected. Access to the fuses for replacement is secured by sliding the front cover vertically upwards, when the words "Fuses Isolated" appear in the mechanical indicator panel. Should this be done with the switch in the "on" position, the action of sliding the cover will automatically place the switch in the "off" position. For wiring, access is gained by sliding the front cover upwards, removing the two screws then disclosed, and withdrawing. A detachable earthing block is provided for use with cable incorporating an earth wire. The price is 56s.



Sanders consumers' control unit

Industrial Lighting System

A system of lighting designed to meet the needs of industry, the "Light-Line," made by CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2, has three main parts: trunking, control assembly and reflector. It allows infinite variations of spacing and number of lamps to be made quickly and without disorganization. A choice of reflectors meets most requirements and single- or three-phase wiring can be used with safety. Suspension may be from trusses, purlins, beams or directly from ceilings and the suspensions spacings may be arranged up to 13ft apart to suit the construction of the building.

Mains wiring normally enters at one or both ends of any run, but may be brought in anywhere along the length. The tapping blocks will take 7/·029 conductors looped. Accessories including control units are mounted on a separate tray and are wired to a two-pin plug which engages a socket forming part of the mains tapping block. Particular attention has been paid to earth continuity throughout.

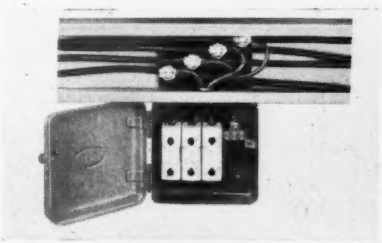
The trunking, end plates and suspension strips are finished in French grey industrial enamel and the gear tray and reflectors in "Permawhite" high duty white enamel.

Fused Tapped Cable Trunking

The cable trunking system produced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, makes it possible to dispense with multiple runs of conduit and distribution boards, since each outlet is equipped with a fused tap-off unit giving individual protection. Standard cable trunking, fused tap-offs and terminal bases are supplied separately, assembly being carried out on site. Where outlet points are required a hole is drilled in the trunking and the tap-off unit secured by a bush and locknut.

Inside the trunking, near each outlet point, a terminal base is fitted and secured by self-tapping screws. Cables are laid in the trunking and at the terminal position the bared end is clamped in the terminal slot by a hexagon nut. Circuit cables are fixed to the top of the fuses and

G.E.C. fused tapped cable trunking



clamped between the main cables and the metal strip in the terminal slot.

The fused tap-off units consist of heavy steel cases (6in by 6in by 2½in) with a hinged door, securing screw and a sealing lug. Fitted internally are 20 A porcelain unit fuses with h.r.c. cartridge or rewireable fuse holders, and, where necessary, a three-way neutral connector. In the case of h.r.c. cartridge fuses, fuse links are not included. The terminal bases are of moulded material, mounted with heavy, slotted, tinned-brass terminals of the line-contact type.

Rosin Cored Solders

A rosin cored solder known as "Actol" has been introduced by ENTHOVEN SOLDERS, LTD., Enthoven House, 89, Upper Thames Street, London, E.C.4. It is a fast-wetting pure rosin cored solder which is chlorine free and it leaves a hard, non-hygroscopic residue of maximum insulation resistance. Another advantage claimed is its stellate core. This patented core shape designed for speedy flux release combines the benefit of a single core of flux of constant quantity with six points of rapid solder wall collapse. "Actol" can be used on non-ferrous metals and many electro-plated surfaces. It is available in all standard tin lead alloys in 10–22 s.w.g.

Convection Heater

Special attention has been paid to safety in the design of a convection heater brought out by HOLBOURN DOMESTIC APPLIANCES, LTD., Strood, Kent. Measuring 20in by 16in by 6in, the unit has a 3½in air gap at the bottom. Convected heat is provided by cold air entering at the bottom of the apparatus through a glass wool filter and passing through the elements and out at the top of the apparatus at a temperature of 200 deg F at a rate of 70 cu ft/min. The two sides of the heater are partially open to provide a little radiant heat for objects near the floor. To protect the elements the top and sides of the heater are fitted with openwork expanded metal.

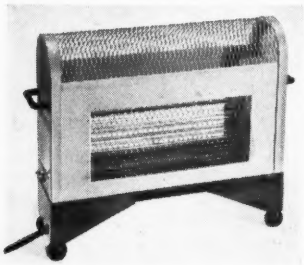
The outstanding feature of the heater is that the 1¼ kW elements, which operate at black heat and are thermostatically controlled, are composed of fine nickel-chrome wire spiralled round a cone of fibre glass, the whole being encased in the same material. The wire is thus completely covered and insulated, so that no short circuit can be caused by metallic objects falling across the strands. The price is £7 9s, plus £5 9s 6d purchase tax in the U.K.

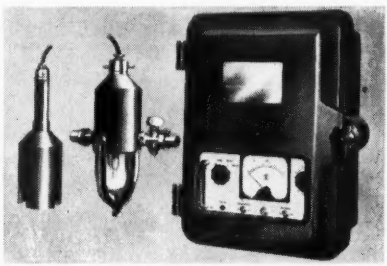
Industrial pH Meter

The Model 28 industrial pH meter made by ELECTRONIC INSTRUMENTS, LTD., 17, Paradise Road, Richmond, Surrey, may be used by itself or linked with standard recorders and controllers of the type used for measuring temperature, pressure and liquid level. This enables the plant engineer to set up a complete pH control installation with the minimum of trouble and often with equipment already to hand. The instrument will run for several days with a stability of ± 0·02 pH without routine attention and complete temperature compensation enables the electrodes to be standardized at one temperature and to operate precisely at all other temperatures without readjustment of the controls. The instrument—which is designed for wall or panel mounting—is hermetically sealed and may therefore be installed in the open or in an atmosphere containing noxious fumes or vapours. Provision is made for pressurizing, and a flameproof case can be supplied for use under exceptionally hazardous conditions.

Two developments in electrodes are also announced by the firm. The first is a high temperature electrode consisting of a complex glass as the pH responsive membrane, together with arrangements for stabilizing the internal elements of the electrode. They may be used over the whole pH range, and as the glass contains no sodium, continuous operation at 100 deg C and in strongly alkaline solutions is possible. The second improvement is the provision of a sealed reference electrode which does not require regular replenishment of the potassium chloride solution. It may be used under vacuum, or at pressures up to 50 lb/sq in, at room temperatures, or at 100 deg C.

Left: **Holbourn convection heater.** *Right:* **Electronic Instruments industrial pH meter and electrodes**





STOCKS and SHARES

IMMEDIATELY before the Easter holiday the accumulation of news from the Communist countries reached a total large enough to make a distinct impression on sentiment in Stock Exchange markets. The most obvious outward signs were buoyancy in Government stock prices and, by contrast, a sharp drop in shares connected with copper, rubber, tin and other commodities. In the industrial market, there was some marking down of prices, especially in the case of companies believed to be heavily engaged in armaments work, although the idea behind this was usually regarded as too premature to induce any serious or widespread selling. In the markets dealt with here, Telephone Properties have been an outstanding feature with a rise to 96s, just trebling their price in three months. The Reyrolle dividend, making 12½ per cent for the year, compares with the previous year's equivalent, allowing for the capital bonus, of 10 per cent.

The Tax Burden

The weight of A.E.I.'s tax burden, which left the group last year with a net increase of under £200,000 out of a £2 million expansion of the trading profit, had already been apparent in the accounts. Present scales of taxation were discussed by Sir George Bailey at the company's annual meeting with reference to their effect on industrial efficiency in general, and they were given also as one of the several reasons which influenced the decision of the board not to recommend an increase in the rate of dividend. British Aluminium's preliminary profits statement also bears heavily the mark of the tax-gatherer, for in spite of the maintenance of earnings at near the previous level the net outcome, after tax charges which included £156,000 for the excess profits levy, was a decline of £229,000. In sympathy with the general trend, A.E.I. shares eased last week to 78s 6d and British Aluminiums to 41s 9d.

Switchgear & Cowans

The 5s ordinary shares of Switchgear & Cowans have been well maintained at 16s 3d since last month's profits statement and the declaration of a 22½ per cent dividend for 1952. This is at the same rate as for the two previous years, and includes 2½ per cent as bonus. It is payable this time on capital increased by last year's issue of 100,000 new shares at 10s. Figures for the year relate the experience which is becoming increasingly familiar to the successfully progressive firms, an expansion of nearly 25 per cent in the net trading profit having apparently been more than offset by swollen tax provisions. There is a yield of close on 7 per cent from the shares at their present price.

Telegraph Condenser Dividend

The Telegraph Condenser Co. is bringing up the dividend for 1952 to a total of 20 per cent for the third occasion in succession, but on capital increased since last year by a one-in-four share bonus. Two years ago the procedure was repeated after a one-in-three capital distribution, and a further bonus of one-in-five is now proposed. Trading profits continued to expand last year and although tax charges seem to have risen faster, the ordinary dividend still appears from the preliminary figures to be covered more than handsomely by the net surplus. The 10s shares were bid for at 38s 9d after the news, and show a yield of 5·2 per cent.

The First Quarter

The holiday lull in company news and Stock Exchange markets gives an opportunity to take stock of the position established during the first quarter of the current year. From the point of view of prices, progress has been satisfactory in almost all sections. Gilt-edged stocks were laggard early on, but a late reanimation put prices up by one or two points over the quarter. Industrials as a whole made ground, in some cases decisively, despite the setback in the last week. Economic reports on national affairs made a favourable background for the appearance of a series of good dividend and profits statements.

The accompanying table illustrates the changes which have taken place in electrical equipment and engineering shares:—

Three Months' Prices

Ordinary	5th Jan.		1st April		Rise	
	s	d	s	d	s	d
A.E.I.	75	0	78	6	3	6
Automatic Telephone	60	0	62	6	2	6
Babcock	71	0	72	0	1	0
B.I.C.C.	34	0	36	9	2	9
E. K. Cole	17	0	20	3	3	3
Decca	18	0	27	6xr.	9	6
English Electric ..	59	0	59	9		9
G.E.C.	42	6	43	6	1	0
Mather & Platt ..	42	0	49	0	7	0
Metal Industries ..	40	9	46	6	5	9
Murex	55	0	58	0	3	0
Parsons	55	0	72	6	17	6
Reyrolle	51	3	60	0	8	9
Telcon	26	0	29	0	3	0

REPORTS and DIVIDENDS

Associated Electrical Industries, Ltd.—The annual meeting was held on 31st March, Sir George E. Bailey (chairman) presiding. In the course of his speech the chairman said that production in 1952 was at a higher rate than ever before and shipments reached the record figure of £76 million. The comparable figure for 1951 was £63 million. As a result of the increased turnover the profit, before tax, increased by nearly £2 million to £9.9 million. They had, however, to provide £7.2 million for taxation and only £178,000 was left of the £2 million increase in profit.

In spite of a slight fall in sales for future delivery, orders received in 1952 exceeded production. Orders in hand now stood at £138 million with deliveries spread over four years. Orders for heavy plant for the electricity supply industry had been well maintained. Any reduction had been in the industrial and domestic fields, and had affected such items as motors and control gear, domestic appliances and lamps. For these products the sellers' market had ended and intensive selling was now necessary in order to keep up the load on their factories. The group continued to provide an important proportion of the world's generating plant. Among orders received from the British Electricity Authority was one for a fourth Metropolitan-Vickers 100,000 kW hydrogen cooled turbo-alternator for Castle Donington power station. The turbines for this station would operate at the very high steam pressure and temperature of 1,500 lb/sq in and 1,050 deg F. Important orders for turbo-generating plant had also been received by both the Metropolitan-Vickers and B.T.H. companies from Australia, South Africa, the Rhodesias, Canada, Pakistan, Malaya and Burma, and during the year these two companies commissioned fifty-one sets with an aggregate capacity of 851,000 kW at home and overseas. These companies had also received orders for large waterwheel alternators from overseas, and further orders had been received from the B.E.A. for 120,000 kVA transformers with on load tap changing gear for the new 275 kV "super grid." Important orders had also been received for traction, marine and mining equipment.

The Edison Swan Co. had felt the effect of the tremendous expansion of television, and in the field of cathode ray tubes the demand still exceeded the ability to produce. The Ediswan cable factory, while achieving a record, had been limited by its allocation of copper and steel. The Hotpoint companies had had a successful year in spite of difficulties caused by the abrupt ending of the sellers' market and import restrictions and sterling shortages abroad.

The group exported approximately one-third of its total output, despite the cancellation of orders due to import cuts and growing American, Continental and Japanese competition.

In the field of research they were building up a team of technicians versed in nuclear physics, while both B.T.H. and Metropolitan-Vickers still led in gas turbines for industrial purposes. The 15,000 kW Metrovick set commissioned at Trafford power station in August last was the first gas turbine plant to go into service for the B.E.A.

Ericsson Telephones, Ltd.—Speaking at the annual meeting held on 31st March, Mr. T. Kirkham (vice-chairman) said that although the invoiced sales exceeded those of 1951 by approximately 19 per cent, there was a decline in the profit percentage, due mainly to the lower prices of export orders and the effect of the wage award granted in November, 1951. World trading had become very competitive, largely on account of import restrictions. Their export business represented a substantial part of their total turnover and it was their constant aim to maintain it. Home trade had been steady. Although the Post Office installed nearly 300,000 new telephones during the past year, outstanding applications for telephone service numbered nearly half a million, while 526,000 subscribers had to share their service with others. The company had commenced 1953 with a good order book.

Bruce Peebles & Co., Ltd., held their annual meeting on 30th March, when Sir William Y. Darling (chairman), who presided, said that the greater output had been achieved at greater cost and in face of keener competition. For the first time, the gross output had exceeded £2,000,000. This had been shared by the two main departments, rotating plant and transformers. The effect had not been, however, to reduce the total orders in hand, but with increased competition from abroad it was probable that the intake of orders might be reduced. The extension of the transformer shop would come into use soon and would facilitate higher production. During the past year a fair proportion of their production was allocated for export. To Canada, New Zealand, Australia, India, South Africa and Uganda they had delivered a considerable volume of capital goods including large transformers, hydro-electric generators, large compressor motors, and transformers and motors for steel works, mining and other industries.

The Telegraph Condenser Co., Ltd., reports a trading profit for 1952 of £508,216, as compared with £468,319 for 1951. Taxation requires £311,952, and after meeting other charges, and placing £100,000 to general reserve, it is proposed to maintain the

dividend for the year at 20 per cent on a capital increased by a 25 per cent scrip issue last May, with a final dividend of 15 per cent. The balance carried forward is £83,503 (against £75,248 brought in).

An extraordinary meeting is to be held in June or July to approve the capitalization of a further £50,000 of undivided profits to be applied in paying up 100,000 new ordinary 10s shares on a one-for-five basis.

A. Reyrolle & Co., Ltd., report a profit for 1952 of £2,650,205, as compared with £2,071,898 for the preceding year, and after deducting £1,755,000 for taxation, there is a net balance of £895,205 (against £896,898). It is proposed to pay a final dividend of 7½ per cent, making 12½ per cent for the year on increased capital. For the previous year an interim dividend of 7½ per cent was paid on the old ordinary capital, followed by a final distribution of 6¼ per cent on the present capital, as increased by a 100 per cent scrip issue.

Franco Signs, Ltd., reports a group profit for the year ended 30th September last of £119,736, as compared with £117,116 for the preceding year, and after meeting all charges, including £51,304 for taxation, the profit attributable to the parent company is £29,311 (against £28,358). General reserves receive £5,000 and it is proposed to pay a dividend for the year of 10 per cent (against 7½ per cent). The balance carried forward is £75,342 (against £65,731 brought in).

The Greengate & Irwell Rubber Co., Ltd., reports a consolidated trading profit for 1952 of £908,176, as compared with £1,315,701 for 1951, and after making various deductions, including £518,397 for taxation, there is a net profit attributable to the parent company of £285,074 (against £501,077). The ordinary dividend for the year is 25 per cent on the reconstructed capital, and after placing £150,000 to general reserve, the balance carried forward by the parent company is £146,153.

Charles Clifford & Co., Ltd., report a group trading profit for 1952 of £171,929, as compared with £199,475 for the previous year, and a net profit of £82,702 (against £93,481). The final ordinary dividend is 17½ per cent (same), making 25 per cent for the year (against 22½ per cent), and £74,177 is carried forward (against £56,107 brought in).

The British Electric Resistance Co., Ltd., has announced an interim dividend of 5 per cent (unchanged).

Parkinson & Cowan, Ltd., report a consolidated trading profit for 1952 of £355,422, as compared with £521,745 for the preceding year, and after meeting all charges, including £96,030 for taxation, the net balance is £75,380 (against £147,014). The ordinary dividend for the year is maintained at 7 per cent, but no bonus is paid (against 2 per cent).

J. & F. Stone Lighting & Radio, Ltd., is paying an unchanged interim dividend of 10 per cent.

Parmiter, Hope & Sugden, Ltd., have declared an interim dividend of 7½ per cent (unchanged).

New Companies

Hughlock Hindle, Ltd.—Registered 10th March. Capital £30,000. To carry on the business of motor, tractor, agricultural and electrical engineers and general electrical installation contractors, etc. Directors : J. B. Hindle, J. R. Hughlock, Mrs. Elizabeth R. Hughlock, H. Hindle and H. B. Hindle. Regd. office : 63, Union Street, Chorley, Lancs.

Electric Panels, Ltd.—Registered 16th March. Capital £2. Electrical, mechanical, civil and heating engineers, etc. Directors : J. P. Hourston (director of Electric Power & Communications Trust, Ltd., etc.) and Jesse J. Flood. Regd. office : Norfolk House, Norfolk Street, W.C.2.

D. Airley & Co., Ltd.—Registered 23rd March. Capital £1,000. Electricians, mechanical engineers and manufacturers, etc. D. J. Airley is the first director. Solicitor : Edward A. Barker, 1, Brazennose Street, Manchester.

Auto Electric Service (Birkenhead), Ltd.—Registered 23rd March. Capital £100. To acquire the business of an electrical engineer carried on by T. Crompton at 94, Charles Street, Birkenhead. Directors : A. A. Biden, T. Crompton and E. P. Redman (secretary). Regd. office : 96, Chester Street, Birkenhead.

Modern Automatic Telephones, Ltd.—Registered 26th March. Capital £5,000. Directors : E. Ivens and E. S. Fairweather. Solicitors : Bulcraig & Davis, Amberley House, Norfolk Street, W.C.2.

Liquidation

Stamford Industries (Great Britain), Ltd., electrical dealers.—Meeting on 27th April at 203, Regent Street, London, W.1, to receive an account of the winding-up by the liquidator, Mr. T. A. Moodie.

Bankruptcy

J. H. Coupland, carrying on business at 85, Northgate, Canterbury, under the style of E. J. Ratcliff, electrical engineer.—Last day for receiving proofs for dividend 15th April. Trustee, Mr. A. M. Lander, 1, The Parade, Canterbury, Official Receiver.

NEXT WEEK'S EVENTS

Monday, 13th April

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "The Characteristics and Control of Rectifier-Motor Variable-Speed Drives," by P. Bingley.

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Supply Group. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

LIVERPOOL.—Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Annual general meeting.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. Discussion on "The Relative Merits of Broad-Band Transmission by Beam, Cable and Waveguide," opened by E. C. H. Organ.

At the Royal Society of Arts, John Adam Street, W.C.2, 6.15 p.m. Purchasing Officers' Association, London Branch. "The Merchant's Place in Business."

MANCHESTER.—Grand Hotel, 6.45 p.m. Institution of Works Managers, Manchester Branch. Annual general meeting.

NEWCASTLE-UPON-TYNE.—Station Hotel, 6.15 p.m. I.E.E. North-Eastern Centre. Annual general meeting and conversazione.

SHEFFIELD.—The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Horticultural Applications of Light," by A. E. Canham, followed by annual general meeting.

Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. Film evening.

Monday, 13th April, to Friday, 17th April

LONDON.—Imperial College of Science. Physical Society Exhibition.

Tuesday, 14th April

BELFAST.—Presbyterian Hostel, Howard Street, 6.15 p.m. I.E.E. Northern Ireland Centre. "A Logical Approach to the Problems of Electric Space Warming," by D. H. Parry.

BIRMINGHAM.—Grand Hotel, 7 p.m. Institution of Works Managers, Birmingham Branch. "Works Study and Job Evaluation."

DERBY.—E.M.E.B. Service Centre, 6.30 p.m. I.E.E. East Midland Centre. "The First Stage of the Electrification of the Estrada de Ferro Santos a Jundiai Railway," by R. J. B. Chatterton and D. H. Rooney.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilization Group. "Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery," by J. C. Macfarlane, Dr. J. W. Macfarlane and W. I. Macfarlane.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. Papers on "Digital Computers" and "Recent Advances in Cathode Ray Tube Storage."

2, Savoy Hill, 6 p.m. Illuminating Engineering Society. "Sports Lighting," by M. W. Peirce.

At the Royal Society of Arts, John Adam Street, Adelphi, 7 p.m. Incorporated Plant Engineers, London Branch. "The Maintenance of Process Plants," by G. C. Allfrey.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "The London–Birmingham Television Cable System," by T. Kilvington, J. F. M. Laver and H. Stanesby.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, East Lancashire Branch. "Vibration in Buildings and Structures," by Mr. DeBass.

NEWPORT—Tredegar Arms Hotel, 7 p.m. Newport and District Electric Club. "Underwater Telephone Links," by G. F. Lawrence.

Tuesday, 14th April, to Thursday, 16th April

LONDON.—Grosvenor House, Park Lane. Radio and Electrical Component Manufacturers' Federation Exhibition.

Wednesday, 15th April

BIRMINGHAM.—Imperial Hotel, Temple Street, 7.30 p.m. Institute of Executive Engineers and Officers, Midlands Branch. "The Interdependence of Administrative, Executive and Technical Staff, Part 3," by Dr. W. Pinner.

BRISTOL.—Grand Hotel, 7.15 p.m. Incorporated Plant Engineers, Western Branch. "The Generation of Industrial Power from Process Steam," by E. G. Ritchie.

LONDON.—Connaught Rooms. Electrical Association for Women. Annual conference.

John Adam Street, Adelphi, W.C.2, 2.30 p.m. Royal Society of Arts. "Materials Handling and Processing—Past and Present," by L. Landon Goodman.

PORTSMOUTH.—Chamber of Commerce, 46, Commercial Road, 6.30 p.m. I.E.E. Southern Centre. Discussion on "Economics in Wiring Practice," opened by Forbes Jackson, P. McKearney and A. V. Milton. Annual general meeting.

PRESTON.—49a, Fishersgate, 7.15 p.m. I.E.S. North Lancashire Group. Annual general meeting.

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Applications of Hydraulics," by D. V. Rowles.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre, Students' Section. Annual general meeting, followed by "The Development of Electrical Aids in Anti-Aircraft Gunnery," by D. H. A. Huddart.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. Annual general meeting. "The Economic Basis of Battery-Electric Road Vehicle Operation and Manufacture," by H. W. Heyman, and "Electrical Equipment of Battery Road Vehicles," by W. D. Sheers.

TORQUAY.—Electric Hall, 3 p.m. I.E.E. South-Western Sub-Centre. "275 kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

Wednesday, 15thApril, to Saturday, 25th April

LONDON.—Alexandra Palace, N.22. North London Exhibition.

Thursday, 16th April

BLACKBURN.—Chamber of Commerce, Richmond Terrace, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "An Approach to Maintenance," by M. Brookes.

DUBLIN.—Metropole Ballroom, from 9 p.m. to 2 a.m. I.E.E. Irish Branch. Annual conversazione and dance.

EDINBURGH.—The University, 7 p.m. British Institution of Radio Engineers, Scottish Section. "The Principle and Applications of the Telescribe," by C. A. Gilbert.

EXETER.—Imperial Hotel. The Exeter Electric Club. Annual meeting.

GLASGOW.—Engineering Centre, 7.30 p.m. Purchasing Officers' Association, Glasgow Branch. "Mining Machinery," by David Jackson.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Utilization Section. "The Technique and Development of Automatic Winding in Mine Shafts," by B. L. Metcalf and G. Cuttle.

Connaught Rooms. Diesel Engine Users' Association. Annual luncheon.

Friday, 17th April

BELFAST.—Grand Central Hotel, 8.30 p.m. I.E.E. Northern Ireland Centre. Annual conversazione.

LONDON.—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 10 a.m. National Finals of E.D.A. Public Speaking Competition.

NEW BRIGHTON.—Victoria Hotel. E.I.B.A. West Lancs, Merseyside and North Wales Area. Buffet dance.

SHEFFIELD.—Royal Victoria Hotel. I.E.E. Sheffield Sub-Centre. Dinner-dance.

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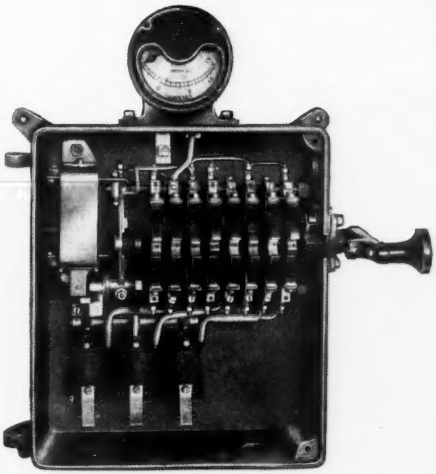

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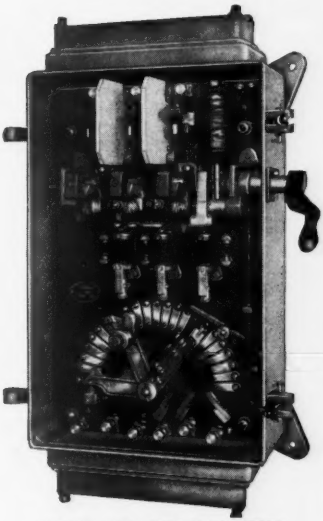

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 20th May, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

13374. Kompfner, R., and Buckingham, J.—Electron-discharge devices. 13th November, 1950. (691900.)

21707. Hirst Electronic Development, Ltd., and Collins, F.—Electric-switching apparatus. 14th August, 1950. (691680.)

32684. Electric & Musical Industries, Ltd.—Pulse-converting circuits. 5th December, 1950. (691858.)

1950

2283. Electric & Musical Industries, Ltd.—Automatic gain control arrangements for radio and like receivers. 29th January, 1951. (691860.)

5874. Postmaster General.—Alternating current signalling receivers. 28th February, 1951. (691741.)

6133. National Research Development Corporation.—Electric cable connectors. 9th March, 1951. (691792.)

7232. Ta'Bois, P. N.—Electric lamp supports. 27th March, 1951. (691599.)

7906. British Insulated Callender's Cables, Ltd., and C.D. Patents, Ltd.—Electric current collecting means of electric vehicles, cranes or the like. 28th March, 1951. (691601.)

10361. Butler, Ltd., H., and Butler, H.—Electrical measuring instruments. 27th April, 1951. (691862.)

11346. Rapid Magnetic Machines, Ltd.—Extractor magnet assembly. 25th April, 1951. (691743.)

12624. General Electric Co., Ltd., and Stenning, L. C.—Relay station apparatus for use in telecommunication systems. 21st May, 1951. (691865.)

14406. Ashley Accessories, Ltd.—Snap-action quick-make-and-break electric switches. 23rd May, 1951. (691605.)

15573. Electric & Musical Industries, Ltd.—Manufacture of photo-electric sensitive or secondary electron emissive surfaces. 13th June, 1951. (691795.)

16693. Boulton Paul Aircraft, Ltd.—Electrically controlled fluid-operated rams. 4th July, 1951. (691745.)

16781. Lummus Co.—Surface condenser and deaerator and a steam-power system comprising same. 5th July, 1950. (691606.)

18056. Associated Electrical Industries, Ltd.—Optical objectives. 15th June, 1951. (691610.)

20584. Harrison, J. P.—Resistant heating elements primarily applicable to electric fires. 20th August, 1951. (Cognate application 25432, 19th October, 1950.) (691868.)

20880. Deutsche Edelstahlwerke Akt.-Ges.—Magnet alloys and the production of permanent magnets therefrom. 23rd August, 1950. (691869.)

21883. Reyrolle & Co., Ltd., A., and Young, A. F. B.—Electric air break circuit breakers. 4th December, 1951. (691614.)

23005. General Electric Co., Ltd., and Partridge, J. H.—Glass compositions and glass-metal seals. 19th September, 1951. (691870.)

23581. Wehrli, A.—Electric cooking device. 26th September, 1950. (691871.)

23593. British Insulated Callender's Cables, Ltd.—Protective coverings for electric cables, pipes and like elongated articles. 25th September, 1951. (691618.)

25478. Imperial Chemical Industries, Ltd.—Electric-blasting detonators. 24th September, 1951. (691873.)

26999. Vicars, Ltd., T. & T.—Electrical heating of baking ovens. 30th October, 1951. (691801.)

27063. British Thomson-Houston Co., Ltd., and Riddle, R. G.—Dynamo-electric machine. 2nd October, 1951. (691620.)

27100. British Insulated Callender's Cables, Ltd.—Machines for lapping strips of material on electric conductors and other articles. 5th November, 1951. (691757.)

28031. Ward & Co., Ltd., H. W.—Electrically driven variable-speed lathes. 6th November, 1951. (691758.)

28442. Communications Patents, Ltd.—Electric coupling devices. 20th November, 1951. (691802.)

30183. National Research Development Corporation.—Single-bearing flange-mounting electric generators and motors. 3rd December, 1951. (691804.)

30530. British Thomson-Houston Co., Ltd.—Operation of electrical impulse counter electron tubes. 15th November, 1951. (691623.)

30782. General Electric Co., Ltd., and Biggs, A. J.—Television receivers. 8th November, 1951. (691805.)

30838. Neracher, C. A.—Electrically operated gear shift and clutch control mechanism for transmissions. 18th December, 1950. (691760.)

1951

555. Minister of Supply.—Electrical pulse code modulation systems. 31st December, 1951. (Cognate application 3400, 12th February, 1951.) (691810.)

928. Telephone Manufacturing Co., Ltd.—Electrical plug and socket connectors. 19th December, 1951. (691813.)

2549. Clyde Crane & Booth, Ltd.—Devices for winding up electric conductors. 15th October, 1951. (691817.)

4124. Elliott Bros. (London), Ltd., and Shotter, G. F.—Measurement of resistance. 20th February, 1952. (691633.)

4234. Gehre, H.—Meters having two measuring ranges. 21st February, 1951. (691634.)

4881. British Thomson-Houston Co., Ltd.—Electric-discharge lamps. 28th February, 1951. (691881.)

5003. General Electric Co., Ltd., Breadner, R. L., Partridge, J. H., and Simms, C. H.—Manufacture of cathode-ray tubes. 29th February, 1952. (691636.)

6041. British Thomson-Houston Co., Ltd.—Electric propulsion and steering systems. 13th March, 1951. (691884.)

6280. Keating, J. F.—Apparatus for combining with television sound from a local sound reproducer. 15th March, 1951. (691823.)

6896. Philips Electrical Industries, Ltd.—Pulse-code modulators for use in electric signalling systems. 22nd March, 1951. (691824.)

7706. British Thomson-Houston Co., Ltd.—Crystal valves or rectifiers. 14th February, 1952. (691708.)

9505. British Thomson-Houston Co., Ltd.—Laminated magnetic cores. 24th April, 1951. (691644.)

9935. Metropolitan-Vickers Electrical Co., Ltd.—Electrical insulation. 4th March, 1952. (691829.)

10769. Westinghouse Brake & Signal Co., Ltd., King, K. G., and Duckitt, H.—Apparatus for the detection of earth faults in two-wire electric supply systems. 11th March, 1952. (691831.)

11193. Babcock & Wilcox, Ltd.—Vapour generating and superheating units. 11th May, 1951. (691886.)

11704. Lumalampan Aktiebolag.—Electric lamp with current bridge. 18th May, 1951. (691647.)

11790. Warner & Swasey Co.—Driving control means for machine tools. 21st May, 1951. (691771.)

12331. Lumalampan Aktiebolag.—Low-voltage incandescent lamp, specially for Christmas-tree illumination consisting of series-connected lamps. 25th May, 1951. (691650.)

14199. Mullard Radio Valve Co., Ltd.—Gas-discharge flash tubes. 15th June, 1951. (691710.)

14687. Cinch Manufacturing Corporation.—Holders for thermionic valves, plugs or other electrical devices having projecting prongs. 20th June, 1951. (691834.)

14804. Sylvania Electric Products, Inc.—Reflector support mechanism. 21st June, 1951. (691654.)

14996. Tudor Accumulator Co., Ltd.—Electric storage battery plates. 14th February, 1952. (691712.)

16518. Hoover, Ltd.—Suction cleaners. 12th July, 1951. (691891.)

18334. Edison Swan Electric Co., Ltd.—Pulse separation circuits. 2nd August, 1951. (691839.)

19572. Patelhold Patentverwertungs & Elektro-Holding Akt.-Ges.—Magnetostrictive vibratory system. 20th August, 1951. (691841.)

19836. Diamler-Benz Akt.-Ges.—Reading lamps. 22nd August, 1951. (691658.)

21364. Ateliers de Constructions Electriques de Charleroi.—Feelers for pressure waves. 11th September, 1951. (691842.)

22195. Soc. Industrielle de Liaisons Electriques.—Electric conductors and coverings therefor. 21st September, 1951. (691843.)

22670. Philips Electrical Industries, Ltd.—Wire-shaped objects comprising a core and a sheath with magnetic powder in between. 28th September, 1951. (691659.)

25095. Standard Telephones & Cables, Ltd.—Coil arrangement for the magnetic deflecting of cathode-ray tubes, especially for television purposes. 26th October, 1951. (691717.)

25224. Standard Telephones & Cables, Ltd. (Federal Telecommunication Laboratories).—Projection display apparatus. 29th October, 1951. (691898.)

25962. Hoover, Ltd.—Irons. 6th November, 1951. (691661.)

25963. British Thomson-Houston Co., Ltd.—Data transmission systems. 6th November, 1951. (691846.)

26515. Westinghouse Electric International Co.—X-ray apparatus. 13th November, 1951. (691847.)

27539/0. British Thomson-Houston Co., Ltd. (General Electric Co.).—Planetary gearing. 23rd November, 1951. (691775/6.)

27683. British Thomson-Houston Co., Ltd.—Cooling systems for electrical apparatus. 26th November, 1951. (691849.)

1952

2168. Orgryteverken Aktiebolag.—Process for reversing periodically the direction of rotation of an electric motor. 25th January, 1952. (691669.)

2749. Philips Electrical Industries, Ltd.—Electric machines of low power. 1st February, 1952. (Addition to 676167.) (691778.)

3986. Schlumberger Overseas Soc. Anon.—Electrical logging apparatus. 14th February, 1952. (691721.)

4116. Akt.-Ges. Brown, Boveri & Cie.—Device for suspending a métallic sleeve in the anode insulator of a current convertor with metallic casing. 15th February, 1952. (691724.)

4724. Kemp, J.—Indicating device for supervising electric lamp circuits on transport vehicles. 22nd February, 1952. (691727.)

5377. Mullard Radio Valve Co., Ltd.—Ionization gauges. 29th February, 1952. (691730.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 18th April.

DIXON. No. 683,287, Class 7. Floor cleaning and polishing machines, scrubbing machines, squeegee machines, carpet cleaning machines, carpet shampooing machines, polish sprayers (machines), all being electrically operated and none being for domestic purposes.—R. G. Dixon & Co., Ltd., Capitol Works, Empire Way, Wembley, Middlesex.

VARIONIC. No. B704,961, Class 7. Variable speed electric motors for power transmission (not for land vehicles).—Nevelin Electric Co., Ltd., Purley Way, Croydon, Surrey.

BI-AX. No. 714,841, Class 8. Electric shaving instruments and fittings therefor included in Class 8.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

NAUTICATOR. No. 712,238, Class 9. Scientific, nautical, surveying, weighing and measuring apparatus and instruments, electrical apparatus and instruments all included in Class 9, calculating machines, and parts included in Class 9 of all the aforesaid goods.—Leiv Jernaes, Hollen, near Kristiansand, Norway. Address for service, c/o McKenna & Co., 12, Whitehall, London, S.W.1.

H.E., Ltd. (design). No. B713,290, Class 9. Electrical, electronic, and scientific instruments and apparatus, all included in Class 9.—Harvey Electronics, Ltd., 273, Farnborough Road, Farnborough, Hants.

SAXAUTO. No. 713,553, Class 9. Electric cables, insulated electric wire, fuse wire and electric resistance wire.—Saxonia Electrical Wire Co., Ltd., Roan Works, Roan Street, Greenwich, London, S.E.10.

SKYPOLE. No. B713,988. SKYTUBE. No. B713,989, Class 9. Radio and television aerials.—Belling & Lee, Ltd., Cambridge Arterial Road, Enfield, Middx.

FILTAVAC. No. 714,115, Class 9. Electric vacuum cleaners, electric dust blowers and electric dust extracting apparatus, all for industrial use.—Filtavac, Ltd., 64a, Church Street, Kensington, London, W.8.

VOLSTAT. No. 714,364, Class 9. Electrical apparatus for regulating and changing voltage.—Advance Components, Ltd., Advance Works, Back Road, Shernall Street, Walthamstow, London, E.17.

MINIAC. No. 714,783, Class 9. Electric switches.—Simplex Electric Co., Ltd., Broadwell Road, Oldbury, near Birmingham.

ULTRAPHIL. No. 711,834. INTRAPHIL. No. 711,835, Class 10. Ultra-violet and infra-red ray apparatus and lamps, all for medical, surgical and curative purposes.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

RUBICON. No. 712,794, Class 11. Electric heating elements included in Class 11, and immersion heaters.—Controlled Heating Units (London), Ltd., Avenue Road, Hampton, Middx.

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CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—29th April. Queensland State Electricity Commission. 500 kVA transformer for the Mackay City Council. (C.R.E. 11343/53. Ten/6040.)* Supply of 660 V power cables and cable boxes. (C.R.E. 11308/53. Ten/6056.)* 3rd June. Supply of oil-engine driven generating plant. (C.R.E. 10700/53. Ten/6071.)*

Bilston. — 14th April. Borough Council. Supply and erection of fifty-six 250 W h.p. mercury discharge lamps, twenty-nine 80 W h.p. fluorescent mercury discharge lamps, and five 100 W filament lamps for street lighting. Borough engineer, 20, Wellington Road.

Edinburgh. — North of Scotland Hydro-Electric Board. H.v. and l.v. distribution lines at Aberlemno, Angus. (See this issue.)

Greece. — ATHENS. — 16th April. Import Supply Committee of the Social Insurance Institute, Athens. Supply of ventilating machinery, and equipment, and refrigeration equipment. (C.R.E. 11521/53. Ten/6045.)*

India.—NEW DELHI.—24th April. Director General of Supplies and Disposals. Supply of h.v. protected telephone equipment. (C.R.E. 11619/53. Ten/6070.)*

Lancaster. — 20th April. City Council. Supply and installation of two electrically driven centrifugal pumps at riverside pumping station. City engineer, Town Hall.

Manchester.—25th April. City Council. Laundry machinery, swimming bath plant, air heater and fan, etc. Superintendent, Baths Department, Town Hall.

Newcastle-on-Tyne.—4th May. Education Committee. Electrical installation at the new Rutherford College of Technology. City architect (education section), 18, Cloth Market.

New Zealand. — WELLINGTON. — 19th May. Ministry of Works. Supply of hydraulic and electrical components for intake gate lifting gear, including 18 squirrel cage 400 V three-phase motors. (C.R.E. 10822/53. Ten/6038.)*

Rochester.—27th April. Rochester, Chatham and Gillingham Joint Sewerage Board. Supply and installation of lighting and power cables, lamp standards, lighting fittings, junction boxes and other equipment at Motney Hill Sewage Disposal Works, Rainham. W. H. Radford & Son, engineers, Albion Chambers, Kent Street, Nottingham.

South Africa. — PRETORIA. — 30th April. Union Tender and Supplies Board. Public address systems. (C.R.E. 11100/53. Ten/6036.)* 4th June. Supply and installation of five complete sets of airport radar equipment. (C.R.E. 11097/53. Ten/6030.)*

JOHANNESBURG.—22nd April. South African Railways. One hundred concentrating type industrial lighting fittings for use with 1,000 W incandescent lamps and a similar number for use with 400 W h.p. mercury vapour lamps. Alternatively 250 concentrating type industrial lighting fittings for use with 400 W fluorescent h.p. mercury vapour lamps. (C.R.E. 11608/53. Ten/6055.)*

South Molton.—2nd May. Corporation. Street lighting equipment. (See this issue.)

Twickenham.—16th April. Borough Council. Eight electrically propelled vehicles for street sweeping collection. Borough engineer, Municipal Offices.

Walton and Weybridge.—25th April. U.D.C. Four sewage pumps, complete with electric motors, starting panels, etc., for Weylands Sewage Works. Surveyor, Council Offices, Walton-on-Thames.

ORDERS PLACED

Hull.—Finance and General Purposes Sub-Committee of the Education Committee. Electrical installation in the first instalment of the New Technical College, Queen's Gardens (£36,541).—Humber Electrical Engineering Co.

South Shields. — Education Committee. Electrical work in connection with the first stage of the new marine and technical college (£15,191). —Law & Burns.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aspley Guise. — Pumping station, office building, underground pumping chamber, and other works for Ampthill and Newport Pagnell R.D.C.; Lemon & Blizard, engineers, 59, Tufton Street, Westminster, S.W.1.

Beckenham. — Works; Carr Bros. (Engineers), Ltd., 93, Rotherhithe Road, S.E.16.

Birmingham.—County modern school in Bernard Road, Edgbaston, and completion of St. Martin's toll market and underground car park in Edgbaston Street; J. F. Gregg, town clerk, Council House, 1.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Blackburn.—First stage of new technical college; Willink & Dod, architects, Cunard Building, Liverpool.

Bradford.—Houses (130), Thorpe Edge, Idle and Haworth Road; W. H. Leathem, town clerk, Town Hall.

Brighton.—Factory, Hollingbury Light Industrial Area; R. Seifert, architect, 28, Great Ormond Street, W.C.1.

Bristol.—Several primary and secondary schools (1953-54 programme); city architect, College Green, 1.

Cardiff.—Industrial premises, Newport Road; Howell & Co., Ltd., St. Mary Street.

Crewe.—New operating theatre at the Memorial Hospital; architect to the Manchester Regional Hospital Board, Cheetwood Road, Manchester, 8

Dewsbury.—Infants' school, Ravensthorpe; H. Booth & Son, Dewsbury.

Droitwich.—Houses at St. Peter's Crescent (35), Vines Lane (12), Friar Street (8), and three shops with flats over at Stalls Farm estate; borough surveyor, Town Hall.

Gateshead.—Erection of factories and extension of existing factories for 30 firms on trading estates (£1,200,000); North-Eastern Trading Estates, Ltd., Team Valley, Gateshead.

Hainault (Essex).—Factory; Bendas & Bendas, Ltd., 1, Helen's Place, London, E.2.

Hastings.—Health centre, school clinic, etc., on site at Hollington; borough surveyor, Wellington Square.

Hatfield.—Secondary school, Wellfield Road; Architects Co-operative Partnership, 34, Gordon Square, W.C.1.

Kidderminster. — Police station and 24 houses at Blakebrook; A. H. Guest, Ltd., Stourbridge.

Leamington Spa.—Two new factories at Queensway estate; R. W. Willcock, 7, The Parade, Leamington.

Leek.—Houses (215), Baddeley Green; M. Daniels, clerk to R.D.C., 6, Russell Street, Leek, Staffs.

Leyton.—Factory extension; B. Lewis, Ltd., Pioneer Works, Church Road, E.10.

London. — Islington. — Flats (136), Sable Street area; E. C. P. Monson, architect, 120, Moorgate, E.C.2.

Long Ashton.—Dwellings (42); clerk to R.D.C., Council Offices, Flax Bourton, Bristol.

Maidenhead.—Methodist church, St. Mark's Crescent; Prefabricated Constructions, Ltd., 28, Pont Street, London, S.W.1.

Manchester. — Large new showrooms at Water Street for D. Rosenfield, Ltd.; Drury & Gomersall, architects, Roxy Cinema, Oxford Road, Manchester.

Middleton. — Houses (140) and 24 aged persons' bungalows, Hollin estate; D. Franklyn, Midland Bank Chambers, Urmston.

Newcastle-on-Tyne. — Church at High Heaton (£17,500); S. Miller, 17 North Street.

Newcastle-under-Lyme.—New factory for Metanodic Engineers, Ltd.; F. E. Stevens, architect, 14, Park Avenue, Kidsgrove.

Newton Abbot.—County primary school on the Buckland estate (£41,000); Devon county architect, Heavitree Road, Exeter.

Ormskirk.—Houses (108), on sites at Burscough and Ormskirk; E. Wright, U.D.C. surveyor, Burscough Street.

Plymouth. — Departmental stores in Royal Parade; Pophams, Ltd., drapers and furnishers, Wilderness Road.

Portsmouth. — Factory, Burrfields Road, Copnor; John Hunt, Ltd., builders, South Wharf, Cleveland Road, Gosport.

Rotherham.—Factory extensions; Kenyon, Son & Craven, Ltd., Eastwood Trading estate.

Saltburn.—Houses (12), Marske Road, for U.D.C.; W. R. Ellis, surveyor, Council Offices.

Scunthorpe.—Three-storey block of lock-up shops and flats at junction of Warley Road and Healey Road; borough architect.

Southall.—T.B. block at St. Bernard's Hospital; North West Metropolitan Regional Hospital Board, 11, Portland Place, W.1.

Southport.—Extensive additions to Greaves Hall Hospital; architect to the Liverpool Regional Hospital Board, Premier Buildings, 88, Church Street, Liverpool, 1.

Adaptations to Fairholme, 8, Oxford Road (£15,000); borough architect.

South Shields.—Factory for S. Newman, Ltd., ladies' wear manufacturers; Cotton, Ballard & Blow, architects, Haymarket House, Newcastle-on-Tyne.

Stockport.—Extensions at Newbridge Lane for Pickerings Produce Canners, Ltd.; W. W. Taylor, architect, 5, Wellington Road South.

Police buildings; G. Bullimore, architect, Lloyds Bank Chambers, Great Underbank.

Sunderland.—Thirty old people's houses at Castletown; borough architect, Grange House, Stockton Road.

Tangmere (Sussex). — County primary school for West Sussex E.C.; T. C. Hayward, clerk, County Hall, Chichester.

Taunton.—Houses and flats (49), King Street area; borough housing architect, 2, Baldwin Road.

Truro.—Additions at the Royal Cornwall Infirmary; architect to Hospital Management Committee, Roxburgh, Clifton Down, Bristol, 8.

Walsall.—Branch library at Coalpool; C. C. Gray, architect, 15, Bridge Street.

Wednesbury.—Dwellings (124), Long Knowle site, for R.D.C.; Bishop Burns & Co., 28, Benson Avenue, Goldthorn Park, Wolverhampton.

Welwyn Garden City.—Community Centre, Ludwick area; Louis de Soissons & Partners, architects, Midland Bank Chambers.

West Ashford (Kent).—Houses (100), on a portion of Hothfield Common, for R.D.C.; J. R. Mann, architect, 16-18, High Street, Canterbury.

Whitley Bay.—County modern school for Northumberland C.C. (£156,000); county architect, County Hall, Newcastle-on-Tyne.